Gas Journal

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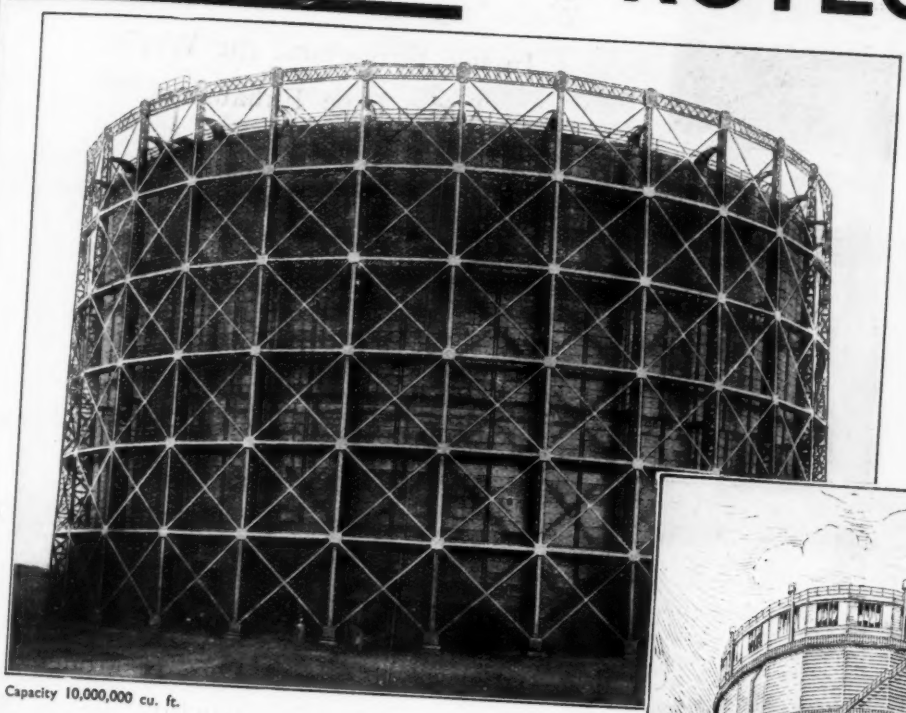

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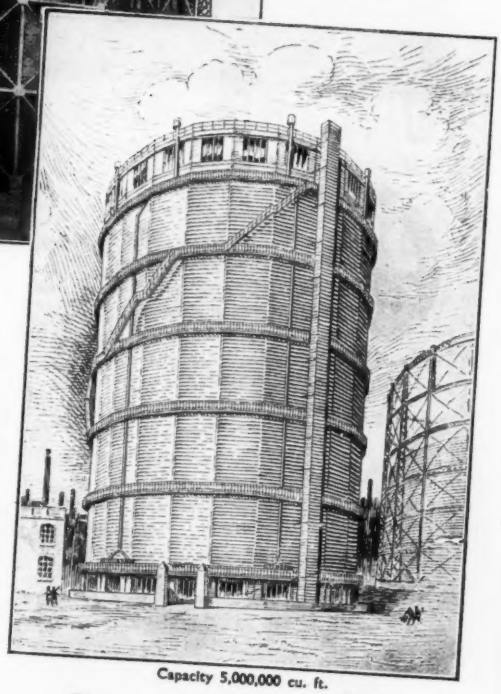

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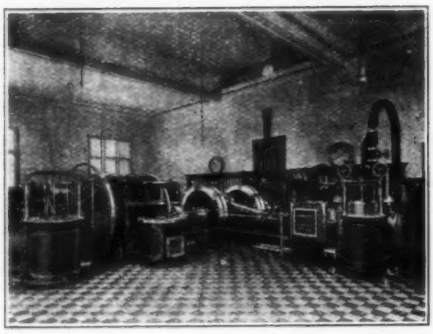

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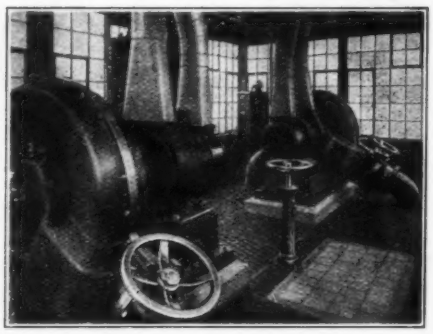

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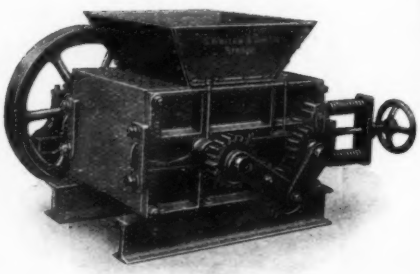

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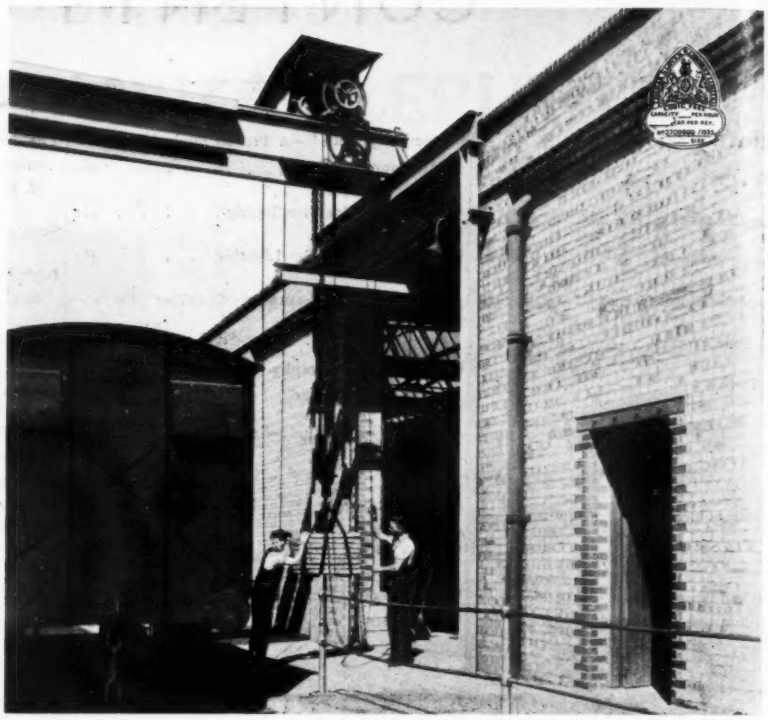

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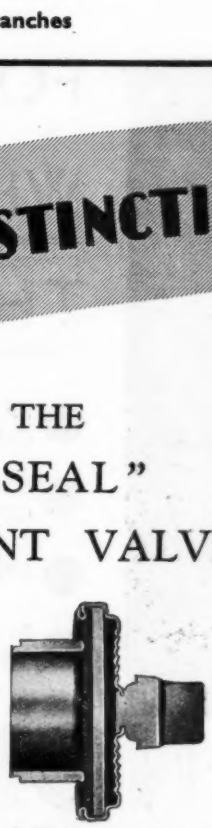

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Gas Journal

AUGUST 28, 1935

Vol. 211. 87th Year No. 3771

Editorial Notes

Works Control

A HIGHLY interesting and, we suggest, uncommon outlook on gas-works practice is put forward by Mr. T. H. Prater, of Margate, in an article published in to-day's "JOURNAL," and we have no doubt that his view will attract widespread attention. His idea, briefly stated, is that gas production should be looked upon as a whole, and not as carbonization, condensation, exhausting, and so on—in other words, a number of separate departments in which the aim is always to reduce costs compared with the previous year. Extra cost in one section is obviously justified if it is more than offset by saving in another section—if, that is, the cost of the therm into holder is reduced. This policy is followed by the Isle of Thanet Gas Company and is largely responsible for the low price at which gas is sold in its area of supply.

As an example of what is inferred by this outlook—the avoidance of water-tight compartments in the costing system—Mr. Prater refers to oxide purification. At Margate, where a gas of 460 B.Th.U. is made with considerable steaming in continuous vertical retorts, revivification *in situ* is not practised, and the author shows how, in his case, this saves money. Keeping the oxygen in the gas at a minimum by avoiding admission of air to the purifiers means in effect a richer gas which in turn allows of greater dilution by steaming. By cutting out air for revivification *in situ*, and having an oxygen content in the finished gas of 0·4% instead of 1%, the volume of gas of 460 B.Th.U. (the diluent being water gas) can be increased by 5·6% with the same coal usage. At Margate, allowing for cost of production, this means a daily addition of revenue of £6 to offset any increased purification costs. Actually, however, purification costs have been 13% less during the past three years with the 0·4% oxygen content than in a similar period, immediately previous, when the oxygen content was 1%. Having remarked that "one cannot help wondering how often revivification *in situ* is used as an excuse for explaining away the presence of excessive inerts in town gas due to lack of proper works control," Mr. Prater mentions that the total inerts in the gas delivered to the Margate district in 1934 averaged less than 8%.

The foregoing is one instance, but a very telling one, of the economies which can be effected by viewing the gas-making process as a whole, and costing accordingly. There are many other points of interest in the article by Mr. Prater, not the least of which is the use of exhaust steam for coke quenching and for steaming the retorts; and then there is an informative and very useful section dealing with controlled cracking of the nascent gases in continuous vertical retorts—a subject regarding which we have had a good deal to say in these columns during the past few years. At Margate the effect of using "trunk feeds" of a simple design on the gas make per ton when carbonizing the same coals has been most marked. The volume of the unsaturateds in the gas per ton of coal has been increased by 40%, and this richer gas has allowed of greater steaming—to the extent of increasing the gaseous therms per ton by as much as 8%. The article indicates what can be accomplished by a balanced outlook on, and close attention to, "works control."

Street Lighting Decisions

THIS month the Turriff Town Council considered the question of public lighting of the burgh, and in the result electricity won by five votes to four. This fact is unfortunate for the citizens, and more than strange in view of the discussion which took place prior to the voting. The Provost himself said that all the argument was for gas, and emphasized that the people were fully satisfied with the gas lighting; he not unnaturally expressed surprise at the reaction which accounted for the result. The Turriff Gas Company quoted for a ten-year contract. For what was stated to be equivalent lighting the tender of the Electricity Company was more than double that of gas, and it was admitted at the meeting that this difference would mean an addition of 2d. to the rates. However, in the event, the Turriff ratepayers are to enjoy the doubtful pleasure of being saddled with an extra 2d. in the pound for a notoriously unreliable source of illumination.

We mention this matter as once again indicating the need for making the public and local authorities fully aware of the progress of gas—of ensuring that the public is "gas minded." Too often the mention of electricity unsettles reason, and it is up to all of us to do everything to supplant in the public mind electrical fancies by gas facts. During recent months we have been able to record that borough after borough has entered into long-period contracts for improved gas lighting of its streets. Ten-year contracts are the order of the day, and in the Metropolis recently new contracts have been signed for gas lighting for periods up to as long as fifteen years. Local authorities are becoming seriously concerned with the frequent failures of electric lighting systems. Only a fortnight ago we commented on the decision of the Cambridge Town Council to enter into a ten-year contract for street lighting with the Cambridge University and Town Gas Light Company, and we mentioned the nature of the voting for and against the Street Lighting Committee's recommendation. All seven women councillors voted solid for electricity; none of them refrained from voting, as did twelve men. The Street Lighting Committee had gone thoroughly, from the economic and technical points of view, into the relative merits of light-

ing the town by gas or electricity, and had arrived at a definite conclusion. Whereupon all the women councillors voted against their own Committee. We repeat, there is real need for us to supplant in the public mind electrical fancies by gas facts.

The Omagh Urban District Council, however, we are glad to note, has a more balanced view than the Turriff Town Council as to the relative merits of gas and electricity for street lighting. At Omagh it has been decided that gas shall replace electricity for public lighting; and we congratulate the ratepayers of the district upon their good fortune. Perhaps Turriff, after experience of the vagaries of electricity, will follow Omagh's example and return with a sigh of satisfaction to gas. And we may mention that Omagh is only one of three towns in Ireland which have reverted to gas after experience with electricity, the others being Lurgan and Warrenpoint.

Dublin's Housing Schemes

THAT " Dublin through all vicissitudes remains the same city, with the same characteristics as of old," was asserted by Mr. J. W. McLusky, of Glasgow, at the annual dinner of the Irish Association of Gas Managers, and this is no doubt perfectly true in the broad sense in which the remark was intended to apply. Dublin possesses alike characteristics and a charm which will be its own in times to come, as they have been in times that are past. But this is not to say that Dublin does not progress; on the contrary, the occasional visitor must note signs of forward movement in many directions. Mr. McLusky, indeed, in the speech already referred to, alluded to the progressiveness of the city so far as the Gas Industry is concerned and he had in mind, when doing so, the phase of the lives of the people which is the subject of the present article.

Passing through the bounteously endowed country in the neighbourhood of Dublin, or visiting the delightful little seaside places on its borders, one would have to be quite unobservant to be unimpressed by the number, and character, of the housing estates that have been, or are being, brought to the service of the community. It is evident that in the Free State housing needs are well understood. While, on the one hand, the dwellings are certainly in many cases helped, so far as appearance is concerned, by the setting in which they are placed, on the other hand special effort must have been called for in these instances to ensure buildings which harmonize with that setting. During a chat at the Dublin Mansion House, the Lord Mayor, Alderman Alfred Byrne, who is becoming quite an institution in the city—he is now in his sixth year of office—showed by what he said how keenly interested he is in making available better homes for the people, and this policy the Gas Company are actively assisting to forward, by the provision of suitable modern equipment. In spite of the activity of the Electricity Supply Board, Alderman Byrne (without " taking sides ") makes no secret of his appreciation of the paramount service that gas is able to render in this connection. He is evidently in agreement with Mr. McLusky that " gas must go in eventually, and it is better and cheaper to put it in at the start than later on."

Speaking at the Irish Association dinner, the Lord Mayor gave expression to his interest in the subject when he said it was true that the Gas Company in Dublin, and gas undertakings elsewhere, are providing gas in the homes of Ireland, " and with some of their spare cash they should come along and assist the municipalities to provide good houses, and at the same time provide customers for themselves." This is all very well, but in furnishing good gas, good equipment, and good service, gas undertakings are already playing a big part in the provision of better homes. Moreover, it has to be borne in mind that the gas company is invariably in the front rank of ratepayers in its own town, and therefore takes its share of the risk of loss entailed in any financial programme embarked upon by the local authority—a risk which would become an accomplished fact, when it was necessary (as we believe is sometimes the case) to let the houses at uneconomic rents. And then, gas companies do not always have a lot of spare cash to invest in, as Alderman Byrne suggests, " sharing the responsibilities of the public authorities who are doing so much to provide them with good customers !"

However all this may be, the Lord Mayor of Dublin is a man of ideas, of reasoned optimism, and of unbounded energy, and it was a pleasure to hear him discourse at length, in the quiet of his own reception room, on matters near to his heart, as it was also a pleasure to be shown by him the great drum from which the winning hospital sweepstake counterfoils are extracted, and to have explained the unassailable precautions taken to ensure that everything is " fair, square, and above-board."

Gas Company Make Better Homes

REFERENCE has been made to the fact that the Gas Company in Dublin are actively co-operating in the schemes going forward to provide better homes for the people. The Distribution Department are intensely active, in this connection, and the details of one scheme in particular were explained by Mr. H. F. Cotton, Distribution Engineer, Alliance and Dublin Consumers' Gas Company, during an inspection of the Company's newly completed showrooms—showrooms which are replete with every modern gas-consuming appliance that can minister to the great cause of Home Service. The scheme starts off with a very attractive feature, inasmuch as it permits the customer to know the precise extent of his liability to the Company. There is nothing " in the air," so to speak. This is a consideration which, one may venture to think, is of more importance than ever before, in these days when strict budgeting is so insistently called for through the growth of the credit purchase system. There are no doubtful items; and there is no opportunity for the customer to say to himself " This has cost more than I expected would be the case." Just the one single amount, to cover everything that the Company offer to do.

That is to say, the Dublin Gas Company, for £40, will make the home perfect by furnishing it with a complete equipment for cooking, heating, and hot water supply fitted and left working. The equipment is specified, and has been carefully selected to meet the circumstances. Taking the kitchen first, the Company supply and fit an all-enamelled " Regulo " controlled gas cooker, with plate rack; an " Ideal " coke boiler, lit by means of a gas poker; an " Ascot " instantaneous gas multi-point water heater, for use during the summer months; and a gas iron in enamel finish. For the sitting room, there is supplied a grate to burn solid smokeless fuel (with gas ignition), in tiled surround. Provision for the dining room is in the form of a seven-radiant panel fire, and for three bedrooms there are five-radiant panel fires, in all instances in tiled surrounds to match any scheme of decoration. As an alternative to tiled surrounds, in the case of the panel fires, attractive wall plaques are available.

The appeal which an offer of this character must make alike to householder and builder (for, to repeat, " gas must go in eventually, and it is better and cheaper to put it in at the start than later on "), should adequately reward the Company for their enterprise.

The Methanol-Soda Process

In the "JOURNAL" to-day Messrs. Hoffert, Claxton, and Hancock, of the National Benzole Company, discuss the removal of carbon disulphide from benzoles by the methanol-soda process. Recent developments in the recovery and refining of benzole have, of course, rendered the problem of sulphur removal of greater importance. With the acid-washing process of refining benzoles, no great difficulty was experienced in reducing the amount of sulphur to the necessary limit. In the new processes for refining motor benzole, however, which either eliminate or restrict the wash with concentrated sulphuric acid, thiophen and its derivatives are no longer removed to any appreciable extent. Consequently it is necessary to remove the carbon disulphide much more completely in order to reduce the total sulphur to the limit previously attained. Another factor influencing the problem is brought in by the active carbon process of benzole recovery, in which the greater quantity of carbon disulphide removed from the gas appears in the crude benzole.

Elimination of the carbon disulphide by fractionation is troublesome and necessitates additional storage, also the distillation and the evaporation losses are fairly heavy; hence chemical processes are preferable. Dealing with the methanol-soda process, the authors point out that the use of caustic soda and methyl alcohol possesses the advantage that the methyl alcohol can be recovered efficiently and in high concentration comparatively easily and used again for further carbon disulphide removal. Moreover, the recent production of synthetic methyl alcohol has made available comparatively cheap supplies of this material in a much purer form than hitherto. Their investigations have shown that the use of methyl alcohol instead of ethyl alcohol has other important advantages. It is possible to reduce the carbon disulphide in motor benzoles with comparatively small amounts of methyl alcohol and caustic soda, and the process is also suitable for removing carbon disulphide down to very low proportions in the preparation of pure benzene. Also, carbon disulphide is less soluble in methyl alcohol than in ethyl alcohol, which renders the subsequent recovery of carbon disulphide simpler. The carbon disulphide can be recovered either as such or as sodium methylxanthate. It is suggested that the latter material should prove effective as a soil fumigant; and as it is merely a by-product in the process, it could be sold at competitive prices. Mention is also made of the proposal to use alkali xanthates in connection with the synthesis of thioindigo dyes.

Having dealt with the experimental work in the laboratory, the authors give a great deal of information on works practice, and in this connection acknowledgment is made of the assistance of the Gas Light and Coke Company, the Newcastle-upon-Tyne and Gateshead Gas Company, and the Staffordshire Chemical Company. A useful table is included setting-out the best relative proportions of methanol and caustic soda to use in practice. These proportions are, of course, governed largely by economic considerations. It is stated that unless a high recovery of methanol is being obtained the total cost of the methanol and caustic soda used for removing a given amount of carbon disulphide decreases within limits as the ratio of caustic soda to methanol increases. Hence, under these conditions, it is more economical to use a high ratio of caustic soda to methanol. There is, however, a certain limiting ratio of caustic soda to methanol beyond which little saving in methanol is effected. Also, too high a ratio leads to practical difficulties, such as blockages caused by deposition of solid caustic soda and the resinification of the unsaturated constituents of benzoles with subsequent emulsification difficulties.

The final section of the contribution is concerned with the recovery of the methanol and carbon disulphide. The costs of the process obviously depend on the prices at which methanol and caustic soda can be obtained and the efficiency of the recovery of the methanol. These costs will be considerably reduced where there is a market for the carbon disulphide or the xanthate.

A Splendid Effort

In 1933, West's Gas Improvement Company and the Editor of *West's Gas* published a Summer Number of their house organ entitled "Gas the World Over." It took the place of the ordinary issues for July and August. In doing so they set themselves a very high standard, which, however, was maintained in the Summer Number last year, which contained prize winning essays in a Competition the Company organized at the commencement of the year. Both these issues were very warmly welcomed—and with good cause—by the Gas Industry. Appropriately enough the 1935 Summer Number, which we have before us, is a "Royal Silver Jubilee Number," and we have no hesitation in saying that it will be welcomed as warmly as its forerunners.

The issue surveys the progress effected in the Gas Industry during the past twenty-five years, eminent authorities dealing with particular aspects of the Industry's activities. There is an introduction by the President of The Institution of Gas Engineers, Colonel W. M. Carr, which takes the form of a general survey; and we are heartily in accord with him when he remarks that the extent of the advance in gas engineering practice during the past quarter of a century is of greater magnitude than is at first appreciated by a retrospective view. The advance has been truly remarkable, and the valuable articles in the Silver Jubilee Number arouse a feeling of great confidence in the future and a sense of eagerness to press forward at an accelerated rate towards fuller achievement. A review of the Number will appear later in the "JOURNAL."

Personal

We learn that Mr. THOMAS MCINTOSH FRASER has recently obtained the B.Sc. Degree (Engineering) of London University with first-class honours. He has also won a Royal Scholarship tenable at the Imperial College of Science, Kensington. Mr. Fraser studied at the Constantine College, Middlesbrough, and was recently appointed Technical Assistant to Mr. W. N. Warwick, Coke Ovens Manager, Cargo Fleet Iron Company, Ltd., Middlesbrough.

* * *

Mr. ALEXANDER TRAN, Assistant Engineer and Manager of the Bath Gas Company, has been inducted a member of the Bath Rotary Club.

* * *

We learn that Mr. J. D. MOSLEY, son of Mr. L. D. Mosley, late Engineer and Manager, Seaford Gas Company, has been awarded the B.Sc. in Engineering at London University.

Forthcoming Engagements

Sept.

5.—B.C.G.A.—Yorkshire District Conference at Bradford.

9-12.—ASSOCIATION OF PUBLIC LIGHTING ENGINEERS.—Twelfth Annual Meeting and Conference.

12.—NORTH BRITISH ASSOCIATION.—Annual Meeting at St. Andrews.

12.—Shipping, Engineering, and Machinery Exhibition opens at Olympia.

19.—WALES AND MONMOUTHSHIRE ASSOCIATION.—Autumn Meeting at Porthcawl.

19.—S.B.G.I.—Council Meeting at 11 a.m.

20.—NORTH OF ENGLAND ASSOCIATION.—Autumn Meeting at Whitby.

28-Oct. 1.—B.C.G.A.—Annual General Meeting and Conference at Edinburgh.

News in Brief

A Generous Contribution of twenty-five guineas to the new Launceston hospital building fund has been made by the Launceston Gas Company.

A Special Campaign, reports the Accrington District Gas and Water Board, has already secured new business which, it is estimated, will increase the annual output of gas by no less than 20 million cu.ft.

The Autumn Meeting of the North of England Gas Managers' Association will be held under the Presidency of Mr. W. M. Galleway at the Crown Hotel, Whitby, at 2 p.m. on Friday, Sept. 20, 1935.

South Shields Dividend.—The dividend upon the consolidated stock of the South Shields Gas Company for the half-year ended June 30 was 4¼% and not, as was stated in the "JOURNAL" for Aug. 21, 4½%.

Mr. W. A. Dearden, Engineer and Manager of the Lancaster Corporation Gas Department, in an address to the Lancaster Rotary Club on Thursday, described the process of gas-making in the Lancaster Gas-Works.

An Order has been placed with Messrs. Newton, Chambers, & Co., Ltd., Thorncliffe Ironworks, near Sheffield, by the Alloa Corporation Gas Department, for the complete installation of a crude benzole extraction plant.

An Interesting Exhibition is, we learn from a local correspondent, to be staged by the Liverpool Gas Company in their demonstration rooms at Grenville Street South from Sept. 2. Many of the exhibits will be on show for the first time in Liverpool and a feature will be made of space-heating.

A Novel Form of Advertising has been adopted by Kennoway and Largo Gas Company at their new showroom at Toll Road, Largo. A seat has been placed outside the showroom commanding a fine view of the bay, and two tablets on the arms of the seat bear the slogan "Use More Gas and Enjoy More Leisure."

A Guildford Landmark.—Strolling through the Castle Gardens, Guildford, the other afternoon one of our correspondents chanced upon a large stone pillar bearing a plate notifying the public that it is the remains of the first street gas standard erected in the Upper High Street, Guildford, in 1824, which was presented to the town in July, 1932. Still clearly engraved in the base of the standard are the words "Guildford Gas Light and Coke Company, 1824."

An Imposing Exhibit at the Cornish Industries Fair to be held at Truro during the ensuing week is being undertaken by the Cornish Gas Association. The stand will be equipped by the Truro Gas Company, under the supervision of their Engineer, Mr. R. J. Williams, and the cost will be borne by the members of the Association. As electricity is also to be represented at the Fair, gas is to be forcibly brought before the public by a large stand in the most imposing position in the Civic Hall.

The New Plant of the Clay Cross Company, Ltd., for the production of centrifugally-spun iron pipes is now in operation. The plant is designed for the production of 500 tons per week of all sizes from 4 in. up to 18 in. diameter in both 12 ft. and 18 ft. lengths and for 3-in. pipes in 9 ft. and 12 ft. lengths. A series of tests has shown that the average tensile strength of the spun metal is between 19 and 20 tons per sq. in. The makers claim that the pipes are remarkable for the ease with which they may be machined.

The 1935-36 Syllabus of the Sir John Cass Technical Institute is now available, and we are indebted to the Principal for the receipt of a copy. Students wishing to prepare for the examinations for the ordinary and higher grade certificates of The Institution of Gas Engineers in Gas Engineering are fully provided for by the Institute. Special courses are being given in Gas Engineering (Manufacturing); Gas-Works Practice—Experimental Work; Gas Analysis; Coal Carbonization; and Fuel Analysis, Calorimetry, and Pyrometry.

A Steel Pressing Shop is to be erected by Sidney Flavel & Co., Ltd., Eagle Foundry, Leamington, on the Rushmore Estate. We understand that the Company have purchased the site subject to the Council's plan to build a new bridge and roadway on the south side of the land within three years. The Housing (Disposal of Land) Sub-Committee reported that interviews had taken place with Mr. Percival Flavel with reference to the possibility of the Council assisting the Company to find additional accommodation for the development of their works and so avoid the necessity of their removing part of their works and developing elsewhere.

The Allotments and Gardens of the employees of the Newport (Mon.) Gas Company were recently inspected by independent judges, and on Aug. 16, Mr. R. Wilson Bartlett, J.P., a Director of the Company, awarded the prizes. Mr. Bartlett and Mr. C. F. Williams presented special prizes for the four best flower gardens and for the best garden peas, respectively. Mr. J. H. Canning, O.B.E., J.P., Engineer and Manager, complimented the judges, Mrs. Kathleen Rust, flower gardens, Mr. G. Chambers, allotments, and Mr. H. Basham, produce, on the way they had carried out their tasks.

A New Apparatus devised in the laboratories of the Société du Gaz de Paris for measuring the viscosity of tar products is described in a recent issue of our French contemporary *Le Journal des Usines à Gaz*, by M. J. Verdier. In general, it consists of a number of tubes containing a few cubic centimetres of liquid, which are so mounted that they may be inclined to a pre-determined degree, the apparatus being fitted in an electrically-heated stove. The measurement is effected by the amount of time taken by the liquid to flow over a certain distance in the tubes, time varying between 2 and 3 seconds for very fluid tar to several minutes for heavy material.

Extended Trials of a Gas-Propelled Vehicle were recently carried out in Germany and the results obtained make interesting reading. The Ruhr Gas Company despatched a motor coach on a tour from Essen, Westphalia, to Königsberg, Prussia, and back. The vehicle used was an Opel 24-65 H.P. coach with streamlined body on which was mounted an extra supply of gas cylinders. During the tour, which lasted four days, a total distance of about 740 miles was covered, the net running time being 27 hours 42 minutes at an average speed of nearly 27 m.p.h. The gas consumption during the run amounted to approximately 20,300 cu.ft., equal to about 36½ miles per 1,000 cu.ft.

The Liverpool Gas Company have opened new showrooms in County Road, Walton, Liverpool. The large windows, fitted with bronze strip, reveal a display particularly rich in colour. Outside there is octagonal lighting and inside reflector lighting. Down the centre of the showroom general lighting is displayed with a wide variety of shades. Provision has also been made for floodlighting when the premises are closed. The walls are covered with a representation of limed oak panels, and polished wood blocks have replaced the old floorboards. Over the showroom is the large demonstration hall. An attractive feature of this room, which is warmed by panel radiators, is the globe lighting. At one end of the hall is a platform surmounted by a stage set representing a model kitchen.

Amalgamation and Grouping

United Kingdom and Scarborough.

We learn that the United Kingdom Gas Corporation has offered to buy the preference shares of the Scarborough Gas Company on the basis of £122 2s. 6d. in cash or 112 fully-paid 4½% cumulative £1 preference shares in the Corporation, *plus* 16s. 3d. in cash, for each £100 of preference capital. An offer of 4½% preference or preferred ordinaries is also being made to holders of the Company's ordinary £100 stock.

"Electricity Tolls"

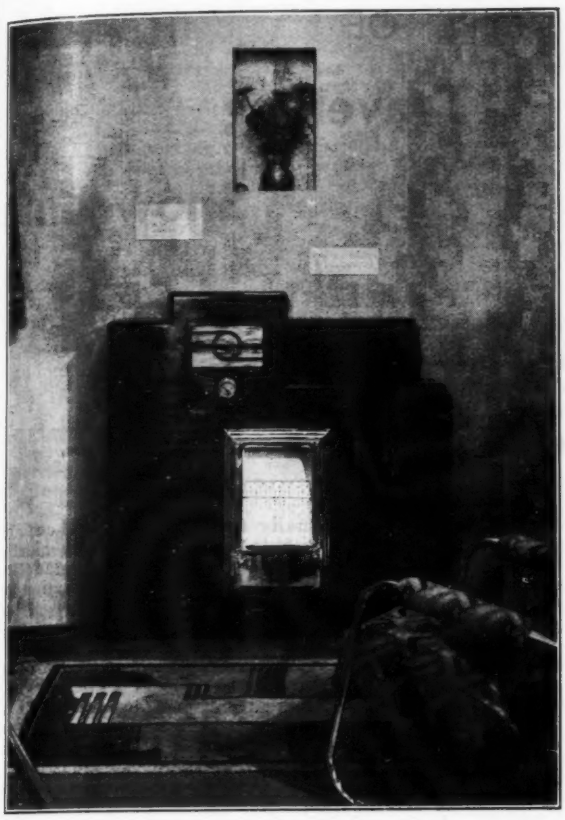
A Protest Against Unfair Standing Charges

The following letter from an anonymous correspondent residing in the South-West London district appeared in last Saturday's *Star* under the title of "Electricity Tolls":

> "I have been shown a friend's bill for electricity supply. His house is one of the roomy places built about 100 years ago.
>
> Because of its size—though the rent and rateable value are very low—there is a standing charge for the service of electricity of £1 6s. 3d. a quarter—in other words, an annual rent of £5 5s.
>
> The installation of electric supply—for lighting only—cost my friend about £25. He has also gas supply, and uses it for cooking."

The correspondent concluded by observing that there was no standing charge from the gas company for the privilege of using its gas.

An Attractive Gas Fire Setting



One of the most striking exhibits in the display of the Australian Gas Light Company at the Royal Easter Show in Sydney last April, of which we gave illustrations last week, was this attractively modern gas fire setting. In addition to the up-to-date panel fire, it will be seen that a built-in wireless set and a useful shelf for books form part of this pleasing and tasteful ensemble. The wider availability of similar settings in this country would surely do much to enhance the prestige of gas for space heating.

Omagh Returns to Gas Lighting

On the recommendation of Mr. W. Tallentire, Engineer to the Omagh Urban District Council, it has been decided to adopt gas in place of electricity for street lighting and to proceed with the conversion in time for the forthcoming lighting season. The scheme includes the erection of 43 new steel columns fitted with 9-light and 6-light "Rochester" lamps complete with "Newbridge" clock controllers. These large lamps will replace central suspension electric lamps. In addition to these 43 lamps, there will be erected elsewhere in the town 100 square lanterns fitted with 2-light medium burners and multi-ray reflectors. These will also be controlled with "Newbridge" clocks.

Omagh is the third town to change from electricity to gas for public lighting since the Electricity Board was established. The others were Lurgan and Warrenpoint.

A New British Standard

Cyanides for Electro-plating

The new British Standard specification for cyanide (Classes A and B) will be of special interest to the electro-plater, as by specifying cyanides in accordance with this Specification No. 622 when ordering, he can be sure of getting a material free from such impurities as might cause damage to the plating bath.

The specification has been prepared by a competent technical committee representing the interests of both manufacturers and users, and while it was drawn up primarily for the electro-plating industry it can be employed for any purpose except that of gold refining.

Particular attention has been given to the method of packing and storing, while there are also useful warnings as to the handling of this highly poisonous material. As cyanides are very hygroscopic and liable to decompose, giving off hydrocyanic gas, they present some difficulty in handling, and the recommendations given in the specification should be closely observed.

The appendix deals with the methods for the determination of the various impurities which might be present. In view of the failure of plating baths from various causes the use of this specification as well as that for nickel salts (B.S.S. No. 564) and nickel anodes (B.S.S. No. 558) recently issued is specially recommended.

Copies of this specification (No. 622-1935) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W. 1, price 2s. 2d. post free.

Gas Aids Photography

A Guide for the Ambitious Amateur

Much excellent photographic work is done by amateurs, which is never turned to profitable account, either because it never occurs to the photographer to do so, or else because he does not know how to set about finding a market for his productions.

Mr. William Stewart's recently published book, "Profitable Photography" (pp. 106 with Index; Sir Isaac Pitman & Sons, Ltd.; 2s. 6d. net), not only shows the amateur photographer how this most interesting of hobbies may also be made remunerative, but, in addition, indicates the great assistance gas lighting can render to the photographic art. It gives special hints on the best subjects to take and how to take them, and is based on the Author's experience as Production Manager of one of the largest commercial concerns in Great Britain.

The various sections include a glossary of photo-press terms, the creation of salable photography, some useful hints in regard to touching up prints and posing subjects, while further chapters deal with gaslight photography and the news picture. Finally, a whole chapter is devoted to the ways and means of profitably disposing of photographs, together with a list of magazines and publishers and details of such remunerative avenues as advertising and story illustration work.

A Gas Light Picture.

The book is attractively illustrated with photographs representative of different phases of the art, and a number of these were taken by ordinary gas light on winter nights. The Author expresses the opinion that gas lighting seems to act more quickly than electric on sensitized surfaces, so that a shorter exposure is possible. Many interesting experiments, he observes, can be made by using gas light, especially for character work and still life. The accompanying illustration, which is taken from the book, is a gas light picture in which the detail in the jacket has been purposely left so as to show what an excellent illuminant gas is for photography.

THE SELF-PROPELLING TYPE OF Travelling Showroom

A description of the mobile gas showrooms which the Gas Light and Coke Company have been operating to good advantage in connection with their recent sales campaigns.

When the Gas Industry thinks of travelling showrooms it generally visualizes the expanding "caravan" type which a number of undertakings have been operating successfully during the past few years, and which is normally towed behind a lorry and erected at one spot for periods at a stretch. For this reason it is thought that a description of the mobile showroom which has its own motive power, as adopted by the Gas Light and Coke Company, may prove of interest by way of comparison—though it should be emphasized that the functions of the two types are in reality entirely distinct, each being intended for different classes of sales work.

It is hardly necessary to say that the gas salesman's field is the whole area of gas supply, and not merely the parts in which the larger proportion of the population is concentrated. As matters are developing in the Industry at the present time, with well situated undertakings enlarging their territory by the extension of mains into outlying districts or by annexing the areas of smaller adjacent undertakings, which may have less capacity and fewer resources, the problem of organizing sales activities in these outlying districts is one which is requiring more and more attention. It is essential to keep the residents instructed in the latest services gas can render and in the most up-to-date appliances whereby it can do so. While a permanent gas showroom in every district is naturally the ideal to be aimed at, it is obvious that in many instances such procedure would be an impracticable and uneconomic proposition.

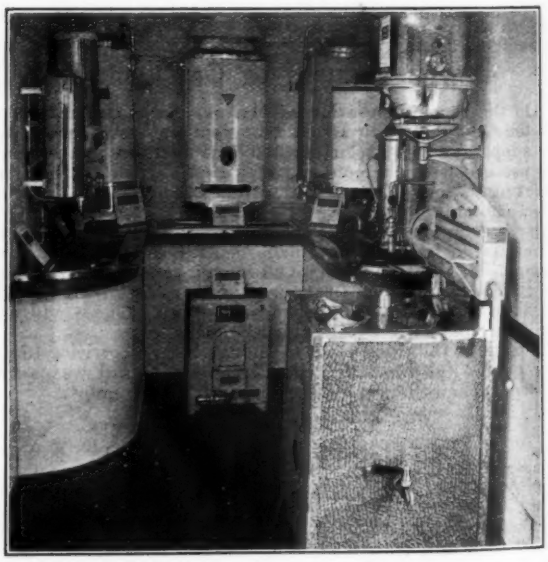
One of the greatest difficulties continually facing the salesman is the fact that gas service and practice have become so well established that in the public mind it has largely become a commonplace. The majority of consumers think they know all there is to be known about it. The travelling showroom is therefore something new and something which will attract attention. It comes as a refreshing but very practical novelty in the shopping sense, and hence it has a special appeal to the modern feverish mind that so readily tires of the usual, no matter how good, and hastens after the latest fashion in any line. The mobile showroom can be used to test the business possibilities of any district at a minimum of expense, while from the selling point of view it is a fact that the moving showroom, touching as it does new ground, must create a mental stimulus to the sales staff which is certain to be reflected in the order book.

The Expanding "Caravan" Type.

A brief reference first to the general principles of the non-motive power or expanding "caravan" type of travelling gas showroom will serve as a basis for our comparison with the self-propelling variety so far as their different functions are concerned. For this purpose we have chosen as typical the travelling showroom of the York Gas Company, which has been operating successfully now for several years, and the following details refer particularly to this vehicle.

The basis of the outfit is usually a substantial van some 20 ft. in length by 8 ft. 6 in. wide when closed up for travelling. This van is fitted with telescopic or expanding sides which when fully extended give an interior floor area of some 20 ft. square. The extensions are supported upon a strong frame with adjustable legs to overcome any small differences in ground level. The erection is a very simple matter, and the whole constitutes a very serviceable showroom. It is usually towed behind a 30-cwt. or two-ton lorry to some suitable site which is conveniently adjacent to a gas supply to which connection is made for demonstration of the interior fittings. Here it remains for a given period as the showroom and district office of the gas undertaking and the headquarters of the sales staff who are working the area. It is not intended that this type of mobile showroom should be continually chasing about from district to district, but rather that it should spend periods in areas where it has not been possible to build permanent gas showrooms. The showroom when in van form ready for transport weighs about seven tons. The York showroom, which is remarkably spacious inside, is regarded as a great asset, forming a permanent feature of the selling organization.

The Gas Light and Coke Company are firm believers in the value of the showroom, as is evident from the very large number scattered all over their district. With such an enormous area of supply, however, it is only natural that there should exist considerable stretches of outlying district which are beyond convenient calling distance of the nearest permanent showroom. For this reason the



A section of the interior of the travelling gas showroom fitted up as a water heating display, showing the variety of appliances which can be accommodated without undue crowding.

Company have, in addition to their two caravan type of mobile showrooms, equipped a fleet of self-propelling vehicles as up-to-date appliance displays, and these have been operating throughout their area with considerable success during the past two years. Furthermore, these vehicles are a great asset in the promotion of sales cam-

paigns even in districts already provided with permanent showrooms.

Converted Motor-Buses.

The vehicles, of which the Company have seven, were originally single-decker passenger motor-buses of about the 30-seater size, which were purchased from a Midlands transport concern. Six of these have A.E.C. engines, while the remaining vehicle is a 40-h.p. Dennis. All the vehicles are mounted on pneumatic tyres. The conversion of the vehicles was effected to the design of the Company's Display Section, the actual work being carried out in some cases by the Company and in others by coach builders. The original roof and framework of the 'buses remain, with necessary alteration in regard to the entrance doors and side panelling. The vehicles are finished in dark green and are of distinctly attractive appearance with their appliance displays let into the sides.

These displays, of which there are two on either side, are behind plate-glass panels measuring about 4 ft. by 3 ft., and these comprise dummy fronts of appliances representing different phases of gas service—fires, cookers, refrigerators, water heaters—in pleasing coloured settings which give an air of realism to the display. These are effectively illuminated at night by lights concealed above the appliances.

Entrance doors in the centre of each side, with roll-down shuttering, give access to the roomy interior of the showroom, which measures about 21 ft. long by 4 ft. 6 in. wide. A rear door is also opened when the vehicle is at rest, and this serves to illuminate the interior. The artificial lighting of the displays and interior is by electricity from the batteries. A flame coloured " Mr. Therm " on the frosted glass rear window shows up brilliantly at night.

Various Duties.

Of the seven vehicles there is one general display van equipped with all classes of domestic appliances; two others are used for canvassing work in connection with L.C.C. housing schemes; while the remaining four are what the Company call " campaign vans." The last-named are periodically equipped for demonstrating any particular gas appliance which at the time is the subject of a sales campaign, and in this capacity each vehicle covers a different district every day, taking its directions from the local manager. It should be mentioned in this connection that police regulations do not permit of what we may term promiscuous touring of districts by this class of vehicle; so that the showrooms always have definite objectives and the addresses of consumers to call upon in the course of their day's work.

The housing scheme vans are fitted up with appliances suitable for the slot consumer, and are sometimes used to canvass builders. A driver and one sales attendant are attached to each vehicle during the course of its normal routine work.

It is surprising how many appliances can be displayed in these vehicles, each of which is fully carcassed for both gas and water, cocks being conveniently placed for connection to the necessary supplies. During their regular touring work, however, there is no opportunity for connecting up, and it is only when the vehicles are parked for lengthy periods that there is opportunity for actually working the appliances. Adjacent to each appliance is a leaflet holder for the explanatory literature, and the water heaters are fitted above stainless steel troughs. Convenient cupboard space is provided, while the interior is complete with carpeted floor and chair for the attendant. There is plenty of head room even for the tallest visitor.

During the course of their touring work the showrooms average about 300 miles a week, and are normally visited by thirty to forty persons each day. Remarkably good sales results have been achieved by these vans, which definitely create an interest in the areas they visit.

They have been on occasions loaned to various undertakings in the South-Eastern Gas Corporation, and our readers will recognize one of them in the photograph of the Chertsey Gas Company's carnival entry which was reproduced on p. 357 of the " JOURNAL " for Aug. 14. When they are sent to assist other undertakings in this way they usually stay on one site for two or three days, during which period they are frequently visited by several hundred people a day. It is recorded that one of these vans when operating for the Maidstone Gas Company brought in business amounting to some £800. On such occasions the gas-operated refrigerators are always in action, and good publicity is obtained by the presentation to visitors of ice made therein.

For the Carnival.

With carnival time in full swing again and display men throughout the Industry racking their brains for something calculated to put up a good showing on behalf of gas, the mobile showrooms of the Gas Light and Coke Company will be of interest to many. Without wishing in any way to disparage the excellent publicity gained by the type of lorry display which is characterized by that hardy annual, " A Bath for Two Coppers," there are certain occasions when a display of a more dignified nature is perhaps more suitable. In addition, therefore, to its normal routine work of touring the district on behalf of the sales department, the self-propelling type of travelling showroom may well prove an admirable gas exhibit for the local carnival or similar event.

So far as their normal function is concerned, however, these vehicles have many obvious advantages, chief of which is their ability to bring the gas showroom right to the consumer's door. The ease and rapidity with which they can be moved from place to place and the fact that they are self-contained and simply adaptable to different forms of gas appliance display will make a ready appeal, while

One of the Gas Light and Coke Company's mobile showrooms equipped for participation in a water heating campaign.

their roominess, neat and business-like finish, and generally dignified appearance make them a valuable addition to the sales organization in outlying districts and new building estates.

Merely a cursory glance at their respective details will make it clear that the self-propelling type of travelling showroom is complementary rather than alternative to the " caravan " expanding type. The functions of the two types are entirely distinct. While the expanding type is more suited for periodic stays in one district, where it becomes for the time being a fully equipped gas showroom and district office or the gas exhibit at an outdoor show, the self-propelling variety is more naturally suited for canvassing, touring, and carnival display work, and the appearance of such vehicles, with their ready advertising appeal, passing through a district is sufficient to stimulate an immediate interest in gas. Both types in their respective spheres can be of excellent service to the sales side of the Gas Industry.

A Brighter Salford

The Salford City Council is to spend £24,685 upon the modernization and improvement of the street lighting equipment in the gas-lighted areas of the city. Mr. E. Crowther, the Engineer and Manager of the Salford Gas Department, in the course of a report upon the lighting system in the part of the city which is illuminated by gas, stated that the obsolete nature of the equipment in use failed to do justice either to the attention given to it or to the illuminant employed.

The adoption of suitable equipment, including controllers for the mechanical lighting and extinguishing of the lamps, could bring about an improvement sufficient to meet the requirements of modern traffic and of the public in general without any increase in annual expenditure.

The Salford Corporation has decided to continue the policy of inviting both the Gas and Electricity Departments to submit quotations for the lighting of new roads, housing estates, &c., for which public lighting is required.

Works Control

by
T. H. PRATER

Gas at 7d. per therm is not common, and as this is the price ruling at Margate we feel that the methods of works control adopted there, as set out in the following contribution by Mr. T. H. Prater, M.Inst.Gas E., A.M.I.Chem.E., Works Superintendent of the Isle of Thanet Gas Light and Coke Company, will prove of general interest to our readers.

The basic principle governing the control at Margate is that the production of the gas shall be looked at as a whole and not as carbonization, condensation, exhausting, washing, &c.—*i.e.*, a number of separate departments in which the aim is always to reduce costs compared with the previous year. This policy infers that extra cost in one section can be considered justified if it is more than offset by some saving in another section.

The ordinary costing system is prone to the defect of giving " water tight " compartments, and it is suggested that such a view of gas production is, in reality, unsound. One such example which has received attention at Margate relates to air for purification.

Oxide Purification.

Revivification *in situ* is practised primarily to lower purification costs by reducing the frequency of box changing. The direct result of such a practice is that the inert content of the finished gas is increased, from which it is obvious that distribution charges must also increase, because the mains are carrying inerts rather than a combustible gas; yet, because such a loss is incapable of proper costing, it is neglected. Similarly, the presence of oxygen in the delivered gas and its consequent corrosive effects on mains and meters must be admitted, although it cannot be put down in terms of money.

Another loss due to revivification *in situ* is found in the steam consumption of exhausters, for such revivification invariably means that the purifiers throw more back pressure that when the air is kept at a minimum—such a difference being 100% or more, due to the accumulation of free sulphur in the interstices of the oxide mass. This back pressure means more steam to drive the exhauster, and therefore greater fuel costs. But most important of all is the loss in therms per ton when revivification *in situ* is practised.

In the case of a works making 460 B.Th.U gas having an oxygen content in the finished gas of 1%, it can be calculated that, if this oxygen is decreased to 0·4% by avoiding air for revivification *in situ*, then a richer gas will, in consequence, be produced, which will in turn permit increased addition of a diluent combustible gas. If the diluent gas is water gas, produced by steaming in vertical retorts, then the volume of gas made can be increased by 5·6%, with the production of the same final C.V. and the use of the same quantity of coal. Hence in a works making 2 million cu.ft. per day, 112,000 cu.ft. more gas can be made for the same coal usage with the lower oxygen content; this has at Margate a value of £6, allowing for cost of production. This sum of £6 is available to offset the increased daily purification charges that are normally thought to result from the maintenance of such a low oxygen content as 0·4%. In actuality, the purification charges at Margate have been less, to the extent of 13%, during the last three years, with the 0·4% O_2 content, compared with a similar period immediately previous, when the O_2 content was 1·0%, although, during the last three years, more gas has been made.

As the oxide used, the method of box filling, and the H_2S concentration of the crude gas have been the same during the whole time under consideration, it must be concluded that it is more economical to change purifiers for lack of extraction efficiency as now, rather than for heavy back pressure, as was formerly necesssary; time being saved both in emptying the box of the softer material and in its subsequent preparation.

In our case, the foregoing argument might be summed up in the following statement: By cutting out revivification *in situ* and effecting the same dilution with water gas produced by vertical retort steaming, we can afford an increased expenditure on purification of as much as £6 per day, which is more than three times the actual total expenditure.

One cannot help wondering how often revivification *in situ* is used as an excuse for explaining away the presence of excessive inerts in town gas due to lack of proper works control.

Gas Low in Inerts.

Following the policy outlined above has made possible the delivery to the Margate district during 1934 of a gas with the following inerts:

Inerts in Delivered Gas—Margate, 1934.

[Extracted from 261 Complete Analyses.]

N_2	4·5% (determined by combustion)
CO_2	3·0 ,,
O_2	0·4 ,,
Total	7·9 ,,

[During the first half of 1935 the O_2 has been 0·3%.]

It is also a fact that any variation in the C.V. of the delivered gas causes definitely less trouble on the district when the gas has a low inert content.

Coke.

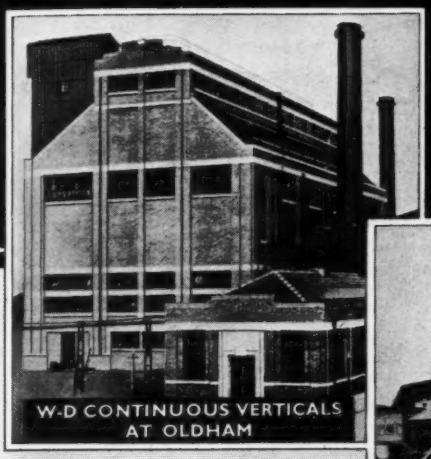
It is common practice with vertical retorts to carry out all the coke quenching in the coke boxes of the retorts themselves, and to quench the coke to the degree of moisture required in the coke as sold, regardless as to whether the coke is eventually to be used on the works or sold to outside consumers.

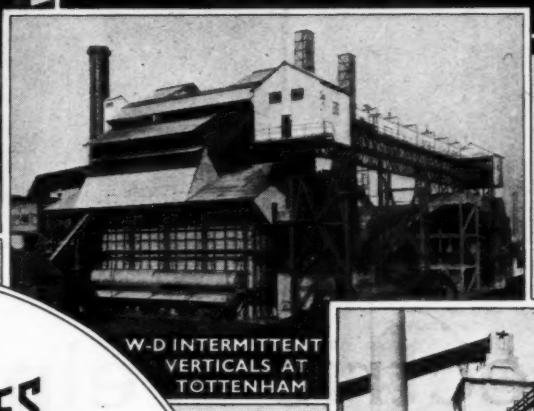
In our case, despite very much written to the contrary, we have found a moisture content of 10% in the small sizes of coke sold to be most satisfactory to the consumer. The moisture is, of course, somewhat lower in amount in the larger grades. Our problem was to supply dry coke to our furnaces, for retort filling, and to the water gas plant, while having 10% moisture in the coke sold. Any method of coke quenching in the coke boxes as normally practised in the W.D. system, besides wetting all the coke produced, regardless of its destiny, has the defect of varying the moisture at different rates of coal throughput. Our practice of using exhaust steam for retort steaming provided us with an easy means of controlling coke moisture. The wetness of the exhaust steam has, during the last six years, always been sufficient completely to quench the coke in the coke boxes, yet, due to the intimate mixture of this wet steam and the hot coke, the moisture in the coke when cold is under 1½%. It is in this state that the coke is supplied to the retort house furnaces for retort filling, and to the water gas plant with consequent economies. But all coke taken out to the coke screening plant is momentarily immersed in water and lightly sprayed for a given time while in the coke skips of the grading plant hoist, the sensible heat of the coke lumps subsequently removing excess moisture. Thus, instead of completing the coke quenching in the retort house, as is usual, the introduction of two-stage quenching has produced obvious advantages.

It is not suggested that 10% moisture would be satisfactory with all coke, but where the ash content of the coke is kept about 5% to 6%, experience has shown that amount of moisture to be satisfactory. And, just as the C.V. of town gas can vary over wider limits when the inerts are kept low without causing trouble on the district, so can the moisture in the coke vary when the ash is low. The buying of low ash coals is essential to the production of good coke, and the ash content of all the coal cargoes received at Margate during the last 18 months is 3·4% on the wet basis.

Incidentally, the amount of water that is used for coke quenching and for sealing the coke discharges on the W.D. system is substantial, amounting to 20 or 30 gallons per box per hour. By using wet exhaust steam as outlined above for coke quenching, sufficient moisture is present to

CONSULT
WOODALL-DUCKHAM
ON
CARBONISATION
AND OTHER
FUEL PROBLEMS


W-D CONTINUOUS VERTICALS AT OLDHAM


W-D INTERMITTENT VERTICALS AT TOTTENHAM

W-D SPECIALITIES

CONTINUOUS VERTICALS
INTERMITTENT VERTICALS
BECKER COKE OVENS & BY-PRODUCT PLANT
T.I.C. TAR TREATMENT
WASTE HEAT RECOVERY
LOW TEMPERATURE CARBONISATION PLANTS
COAL HANDLING & PREPARATION PLANTS
COKE HANDLING & SCREENING PLANTS
"THE WORLD OVER"

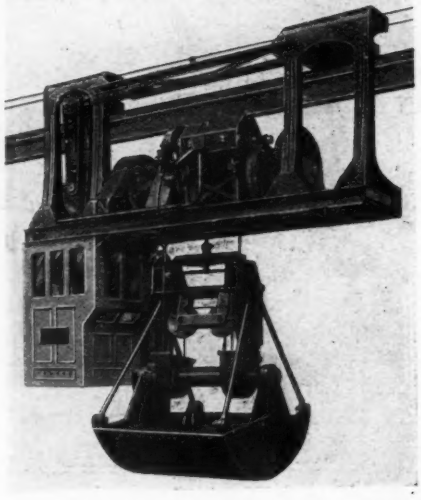
BECKER OVENS AT CORBY

W-D WASTE HEAT BOILER

T.I.C. TAR TREATMENT PLANT

THE WOODALL-DUCKHAM VERTICAL RETORT AND OVEN CONSTRUCTION CO. (1920) LTD., EBURY & ALLINGTON HOUSES, 136-150 VICTORIA STREET, LONDON, S.W.1
MEMBERS OF THE SOCIETY OF BRITISH GAS INDUSTRIES

Electric Telpherage



FOR
COAL
AND
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ROBERT **DEMPSTER** & SONS
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ELLAND.

1855 1935

maintain the water level in the dischargers without outside water supplies, and, by inter-connecting all the discharger box water overflows and arranging an adjustable weir overflow at one end of the retort house, we have for some years entirely cut out all use of water on the dischargers, thus saving water and the consequent troubles of breeze separation, as well as reducing wear on the castings.

Retort and Producer Steaming.

As previously mentioned, the exhaust steam on the works is collected and passed to the retorts for steaming purposes. This steam is obtained from continuously running engines—*i.e.*, boiler feed pumps, main works water pump, extractor, and exhauster engines. This steam meets the requirements for normal retort throughputs, but, at very low throughputs, some steam is by-passed to the atmosphere, while, at the higher throughputs, the exhaust supply is augmented with controlled live steam.

Here again, where costing is carried to extremes, any increased steam consumption on the engines, due to imposing back pressure, would be ruled out as bad practice, unless the whole works is viewed as one unit, whereas when exhaust steam, instead of live steam, is passed to the retorts by adequately proportioned pipes, considerable economies have been proved. Such a system is partially self-compensating, as increased coal throughputs are naturally accompanied by increased exhaust steam from the speeded-up extractor and exhauster engines.

Similar comments might be made about the use of the exhaust steam from the turbo drive to the waste-heat boiler fan, for steaming retort house producers. In this case, an increase in the heats required means more producer gas, which, in turn, means greater fan speed, and therefore more exhaust steam available for the greater amount of producer gas. Such a scheme has worked for several years on our producers without any added water, and gives a gas with an average C.V. of 130.

Cracking.

For some years experiments have been carried out at Margate to find some satisfactory way of increasing the amount of cracking taking place in the upper zones of vertical retorts,* and more than two years ago there were introduced into the upper portion of our retorts devices which developed and have since become known as trunk feeds. Somewhat similar devices have been introduced elsewhere, but primarily to facilitate coal travel where coking coals of the Durham class have been in use.

One of the drawbacks to using washed Yorkshire nuts in verticals is that cracking does not come into full play owing to the comparatively easy gas travel up through the coal charge to the offtake. It has long been known that, by arranging that there should be a space at the top of the retort where the nascent gases can be cracked by radiant heat, improved thermal results will be obtained; the difficulty has been to arrange for this space to be sufficiently large in volume without entering the zone of high temperature, with consequent over-cracking. This difficulty existed as long as the cavity was arranged at the side of the retort, just under the offtake, and was produced by a hanging plate. But, by arranging that the cavity should extend right across the retort, thus providing the large volume and the necessary time contact, while, at the same time, not passing down into the zone of high temperature, a degree of controlled cracking, not previously obtained, has been achieved.

After experiments with different shapes, sizes, and lengths of chute, the use of this device has now become our standard practice. Briefly the device used, which is removed during scurfing, consists of an ¼ in. plate, with a central opening 9 in. wide by 12 in. high, which is pressed vertically against the mouth of the ancillary coal hopper. This rectangular opening communicates with the side of the centre chute, which is constructed of ¼ in. welded plate; the chute having a minor axis of 6 in. throughout, and a major axis of 9 in. at the top, increasing to 15 in. at the base, and passing down 2 ft. 9 in. within the retort brickwork. By suspending the chute centrally in the retort by angle iron brackets on the sides of the retort mouthpiece, and a single centring thrust bolt in the front of the mouthpiece, the nascent gases are allowed to circulate freely around the coal feed. The free space constituting the cracking space is thus some three times greater than with the single hanging plate at the offtake side, as previously used.

Higher Offtake Temperature.

The top of the chute is allowed to remain open, as no advantage has been found by closing this; the gases presumably taking the easier path around the chute and not passing up through the coal in the feed. The only retort rodding done is straight down through the top of the coal feed, and not the slightest trouble of any sort has been experienced. Immediately under the side offtake, the coal level is 4 ft. below the top of the brickwork, while, on the other side of the retort the corresponding level is 3 ft. down. The temperature of the gas at the offtake has risen from 180° C., before the use of the chutes, to 300° C., when the chutes are in use. Liquor spraying of the offtakes is practised, and there has been no trouble of any importance with deposits in the mains.

The effect of the use of these trunk feeds on the gas make per ton, when using the same coals, has been most marked; the cubic feet of unsaturateds in the finished gas produced per ton of coal being increased by 40%, and the methane by 18%. This richer gas has enabled a greater amount of steaming to be done, with the result that there has been a definite increase in the therms per ton of about 8%. These devices have been in constant use since their introduction, and the results are based on more than 18 months' working of the entire gas making plant, and several hundred complete analyses.

The tar now produced is also improved by an increase in specific gravity of 0·03 to 0·04, resulting in better settling, so that it is now possible to sell a tar with less than 5% water, whereas 8% to 10% was the previous water content. One result of the use of the coal feeds which was quite contrary to that expected appears to be an increase in the gallons of tar made per ton. While this seems incredible, yet, with the same three coals, having analyses that have scarcely altered during the last three years, the tar yield has, in fact, increased by at least one gallon per ton.

* "GAS JOURNAL," Vol. 192, p. 301.

Instantaneous Hot Water

New Progas Literature

The new water heating literature recently published by the Progas Company, Ltd., of 121, Victoria Street, S.W. 1, is of a very comprehensive nature, and with its de luxe wrapper and profuse illustrations forms a useful reference to the firm's wide range of instantaneous gas water heaters and accessories.

Among the apparatus described are single-point machines for hand basin and sink use, together with a multi-point heater for supplying all the hot water taps in the house, while details are given of various designs of sprays for attachment to the heaters. The multi-point models can be fitted to an existing hot water installation served by an independent boiler without displacing the boiler. By this means either system may be used. The dimensions, capacities, and gas consumptions of the various heaters are tabulated, and a special leaflet is devoted to the use of Progas heaters in hairdressing establishments.

Of particular interest are the details of the firm's equipment for small property where there are no existing bathing facilities, or in houses where perhaps an additional bath is required. This consists of a Progas heater with flexible supply and various types of bath so designed with a hinged waste pipe that they may be folded up against the wall or into a neat cabinet which conceals it altogether. The waste pipe is so arranged that when the bath is in the vertical position the water outlet is completely sealed.

The technical details of the Progas heater are fully explained with the help of diagrams down to the smallest detail, while the instructions for fitting and cleaning, each step in which is clearly illustrated, are particularly useful, and are among the most complete of their kind we have seen—even to " close-ups " of the individual parts and the tools required for dismantling.

Finally a selection is given of typical advertisement layouts for newspaper publicity, in which connection the Company state that, by special arrangement, they are usually prepared to bear part of the cost of local newspaper advertising of Progas water heaters by gas undertakings. This publication as a whole forms a useful addition to gas water heating literature.

The Methanol-Soda Process of Carbon Disulphide Removal from Benzoles

by
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G. CLAXTON,
and
E. G. HANCOCK

An abridged version of the communication which was published in the July 19 issue of the Journal of the Society of Chemical Industry.

Many crude benzoles contain appreciable quantities of sulphur, which it is necessary to remove during refining before these benzoles can be used as motor fuel or for the preparation of pure benzene and toluene. This sulphur is present chiefly in the form of carbon disulphide, and thiophen and its derivatives.

New processes for the refining of motor-benzole, aiming at the partial or complete conservation of the unsaturated hydrocarbons have rendered the problem of removing this sulphur of greater importance. In these processes, owing to the elimination of the wash with concentrated sulphuric acid or the restricted use of this reagent, thiophen and its derivatives are no longer removed to any appreciable extent. It is therefore necessary to remove the carbon disulphide much more completely, in order to reduce the total sulphur to the same limit as previously attained with the acid-washing process.

Numerous methods have been proposed in the past for the removal of carbon disulphide—*e.g.*, fractionation, treatment with caustic soda at 60° C., treatment with alkali sulphides, disulphides, &c. Fractionation, the method most widely used up till now, involves loss of some benzole even with re-distillation and the use of highly efficient columns. The treatment of benzoles with methanol-soda not only renders, the loss of benzole negligible but enables the carbon disulphide content to be reduced to extremely low limits. Recovery of the methanol allows of the process costs being kept low.

The Methanol-Soda Process.

It has long been known that the carbon disulphide can be removed much more readily if treatment is effected with an alcoholic solution, instead of an aqueous solution of alkali. Under these conditions, a xanthate is formed, which with the excess of alcohol can subsequently be washed out of the benzole with water, and this method was the subject of an early patent.[1] Attention, however, appears to have been paid chiefly to the use for this purpose of ethyl alcohol, which cannot readily be recovered free from water, so that the process must have been somewhat costly, and it is not surprising that this method does not appear to have been applied commercially.

Methyl alcohol, unlike ethyl alcohol, does not form a constant-boiling mixture with water, and consequently it can easily be separated from water by simple fractionation. Hence, the use of caustic soda and methyl alcohol instead of ethyl alcohol for removing carbon disulphide from benzoles possesses the advantage that the methyl alcohol can be recovered efficiently and in high concentration comparatively easily and used again for further carbon disulphide removal. Moreover, the recent production of synthetic methyl alcohol (methanol) has made available comparatively cheap supplies of this material in a much purer form than hitherto.

These advantages led us to a detailed study of the action of methyl alcohol and caustic soda on benzoles containing carbon disulphide, and our investigations[2] have shown that the use of methyl alcohol instead of ethyl alcohol has other important advantages. Given quantities of methyl alcohol and of caustic soda will remove the carbon disulphide more efficiently from benzoles than the same quantities of ethyl alcohol and caustic soda, under otherwise the same conditions. Another advantage is that carbon disulphide is less soluble in methyl alcohol than in ethyl alcohol, which renders the subsequent recovery of the carbon disulphide simpler. Finally, it may be pointed out that the Excise regulations for methyl alcohol are less strict than those for ethyl alcohol. "Blending methanol,"* or denatured synthetic methyl alcohol, can be purchased free from any restrictions, although permission is required for recovery by distillation. It may also be noted that treatment of benzoles with alcoholic alkali removes weakly acidic substances, such as mercaptans, which are not readily removed by aqueous caustic soda.

The carbon disulphide can be recovered either as such or as sodium methylxanthate. While the uses of the former substance in industry are well known, the potential uses of sodium methylxanthate are not so fully appreciated. Thus, according to de Ong[3] potassium ethylxanthate is very effective as a soil fumigant, but its high cost has prevented its use becoming general. There seems no reason why the sodium methylxanthate should not also be effective, and as it is merely a by-product in this process it could be sold at competitive prices. Alkali xanthates have also been proposed[4] for the preparation of thiosalicylic acid, which is an intermediate in the synthesis of thioindigo dyes, and they are also used to a considerable extent in the froth flotation process of cleaning ores, particularly those of copper and lead.[5]

As a result of this study, trials have been carried out on the technical scale, and the process is now in operation on a number of works.[6]

Outline of the Process.

Briefly, the process consists in treating the benzole in the usual washer with caustic soda and methyl alcohol, which react with the carbon disulphide to form sodium methylxanthate:

$$NaOH + MeOH + CS_2 = NaS{\cdot}CS{\cdot}OMe + H_2O.$$

Addition of water to the washer causes separation of the benzole, and the solution of the xanthate together with the excess of methyl alcohol and caustic soda can be run off. This solution is then treated with dilute sulphuric acid in order to decompose the xanthate and neutralize the excess of caustic soda. If a large excess of water has been added, the carbon disulphide separates out completely. After running off the carbon disulphide, the remainder of the residues are fractionated, when methyl alcohol distils over in high concentration and can be used over again for treatment of the benzole. Alternatively, the whole of the neutralized solution can be fractionated, when the carbon disulphide distils over first with a little methyl alcohol and is collected under water.

If the xanthate is required, the spent solution from the washer is treated with carbon disulphide to react with the excess of caustic soda and distilled under reduced pressure, when methyl alcohol distils over and the xanthate is left behind.

The methanol is used both as a reactant and as a solvent for the caustic soda and sodium methylxanthate, and it has been found that 8 to 12 times the theoretical quantity is required. The addition of the solid caustic soda in a finely-divided condition to the benzole in the washer, immediately after the addition of the methanol, has given satisfactory results and avoids the difficulty of preparing beforehand concentrated solutions.

EXPERIMENTAL.

I. The Removal of Carbon Disulphide from the Benzole.

(1) *Comparative Effect of Different Alcohols and Alkalis.*

Experiments have shown that the same amount of carbon disulphide can be removed in a given time by varying ratios of different alcohols and caustic soda. With very

[1] Illingworth, B.P 15,777, 1912.

[2] Hoffert and Hancock, B.P. 416,404 and 428 931.

* Refined synthetic methyl alcohol, containing 5% of "methanol tops" and 0·2% by volume of kerosene as a denaturant in order to comply with Excise regulations.

[3] Ind. Eng. Chem., 1926, **18**, 52; 1928, **20**, 1912.

[4] Farbwerke vorm. Meister, Lucius, and Brüning, G.P. 69,073; *cf.* Leuckart. J. pr. Chem., 1890, **140**, 179.

[5] Taggart, "Handbook of Ore Dressing," 1927, p. 850; Luyken and Bierbrauer, "Die Flotation," 1931, pp. 17, 40, 45, 150, 152, 200.

[6] *Cf.* Wikner and Richardson, Gas J., 1934, **206**, 559.

high ratios of alcohol to caustic soda, the removal of carbon disulphide from benzoles might be expected to be more efficient when using ethyl and higher alcohols then when using the same volume of methyl alcohol, owing to the more favourable solubility relationships of the former alcohols with benzole. In practice, however, for economic and other reasons, it is necessary to keep the proportion of alcohol used fairly low. Thus, the optimum relative proportions of alcohol and caustic soda are largely governed by the relative costs of alcohol and alkali and the efficiency of recovery of the alcohol, and it is an advantage from the point of view of costs to use a fairly low ratio of alcohol to caustic soda.

Under these conditions, better results are obtained with given amounts of methyl alcohol than with the same amounts of ethyl or other alcohols, as shown by the results summarized in Table I., probably owing to the fact that under these conditions the greater solubility of caustic soda in methyl alcohol becomes the dominating factor. The benzole was shaken in a bottle with the alcohol and caustic soda. It was then separated from the spent alcohol and caustic soda, washed thoroughly with water, filtered through a dry filter-paper, and the sulphur present as carbon disulphide determined.

TABLE I.

Series 1.

Benzole, 200 ml. Alcohol, 5 ml. Caustic soda*, 1 g. Time of treatment, 2 hrs. Temperature, 20°.

Alcohol.	Quality.	Sulphur as Carbon Disulphide (% by Wt.).	
		Before Treatment.	After Treatment.
Methyl	Anhydrous blending methanol	0·81	0·14
Ethyl	Absolute	0·81	0·38
isoPropyl	Absolute	0·81	0·74
n-Butyl	Pure	0·81	0·67
Amyl	Pure, b.p, 128—132°	0·81	0·71
Ethylene glycol	Commercial	0·81	0·64

Series 2.

Benzole, 200 ml. Alcohol (95%), 5 ml. Time of treatment, 2 hrs. Temperature, 20°.

Alcohol.	Caustic Soda (G.).	Sulphur as Carbon Disulphide (% by. Wt.).	
		Before Treatment.	After Treatment.
Methyl	0·51	0·81	0·42
"	0·95	0·81	0·17
"	1·82	0·81	0·03
Ethyl	0·48	0·81	0·51
"	1·03	0·81	0·27
"	2·10	0·81	0·16

* In all laboratory tests detailed in this Paper, the caustic soda was used as a coarse powder.

Caustic potash can be used instead of caustic soda, but is more expensive, and lime and ammonia have been found to be practically ineffective.

(2) *Influence of the Concentration of the Methanol.*

The presence of water in the methanol reduces the rate of removal of the carbon disulphide from the benzole. It has been found for small amounts of water that the decrease in the quantity of carbon disulphide removed in a given time by definite amounts of water-free methanol and caustic soda is roughly proportional to the quantity of water added. This is shown by the results given in Table II., which, with those of subsequent experiments, were obtained when carrying out the treatment in an efficient laboratory-scale washer of the typhoon type.

TABLE II.

Benzole (free from phenols and pyridine bases), 1,000 ml. Methanol (water-free), 30 ml. Caustic soda, 6 g. Temperature, 19°.

Time from Start (Hrs.)	0	¼	½	1	1½	2	2½	3	4
Water Added (Ml.)	Sulphur as CS_2 (% by Wt.)								
0	0·64	0·43	0·27	0·14	0·08	..	0·05	..	0·01
5	0·64	0·53	0·39	0·25	0·19	0·15	..	0·10	0·08
15	0·64	0·58	0·50*	0·40	0·33	..	0·26	..	0·19
30	0·64	0·61	0·57	0·50	0·47	0·42	0·36	..	0·31

Thus, caustic soda and methanol to which 10% and 20% by volume of water had been added, removed in 2 hours approximately 90% and 80% respectively of the quantity of carbon disulphide removed when no water was added.

In a further series of tests, a study was made of the variation in the amount of carbon disulphide removed with the concentration of the methanol when the total volume of methanol and water was kept constant (Table III.).

TABLE III.

Benzole (free from phenols and pyridine bases), 1,000 ml. Methanol of varying concentration, 25 ml. Caustic soda, 5 g. Temperature, 19°.

Concentration of Methanol (% by Volume).	Sulphur as CS_2 (% by Wt.).	
	At Start.	After Treatment for 1 Hr. (from Mean Curve.)
100	0·73	0·25
95	0·73	0·30
90	0·73	0·34
80	0·73	0·43
70	0·73	0·52
50	0·73	0·64

Under these conditions, the amount of carbon disulphide removed decreases more rapidly as the concentration of the alcohol is lowered than in the previous tests, as would be expected owing to the fact that not only was the amount of water increasing, but the quantity of water-free methanol was decreasing.

As it has been found, as a result of large-scale trials, that the methanol can readily be recovered at a concentration of at least 95%, only the results obtained when using alcohol of this concentration are given in the further tests detailed below, in which the relative proportions of methyl alcohol and caustic soda have been varied.

(3) *Influence of the Quantity of Caustic Soda Used.*

For a given quantity of methanol and water, increasing the quantity of caustic soda used increases the amount of carbon disulphide removed in a given time, as shown by the results given in Table IV. The effect of increasing the caustic soda, however, diminishes fairly rapidly beyond a certain limiting amount depending on the conditions.

TABLE IV.

Series 1.

Benzole (free from phenols and pyridine bases), 1,000 ml. Methanol (95%), 25 ml. Temperature, 20°.

Time from Start (Hrs.)	0	¼	½	1	2	3	4	5
Caustic Soda (G.).	Sulphur as CS_2 (% by Wt.).							
2·5	0·75	0·64	0·57	0·50	0·45	0·44	0·44	0·43
3·5	0·75	0·63	0·51	0·36	0·32	0·30	0·28	0·27
5·0	0·72	0·57	0·41	0·27	0·18	0·16	0·14	0·13
6·5	0·74	0·46	0·30	0·19	0·10	0·05	0·03	0·03
8·0	0·71	0·43	0·26	0·13	0·06	0·03	0·02	..

Series 2.

Benzole, 1,000 ml. Methanol (95%), 50 ml. Temperature, 19–20°.

Time from Start (Hrs)	0	¼	½	1	1½	2	3
Caustic Soda (G.).	Sulphur as CS_2 (% by Wt.).						
2·5	0·74	0·61	0·53	0·47	0·44	0·44	..
3·5	0·74	0·51	0·36	0·29	0·26	0·25	0·24
5·0	0·74	0·46	0·24	0·14	0·09	0·07	..
8·0	0·74	0·40	0·19	0·08	0·04	0·03	0·02

(4) *Influence of Quantity of Methanol Used.*

As will be seen from the results given in Table V., for a fixed quantity of caustic soda and water, increasing the volume of methanol has a large effect on the amount of carbon disulphide removed in a given time.

TABLE V.

Benzole (free from phenols and pyridine bases), 1,000 ml. Caustic soda, 6·5 g. Temperature, 21–23°.

Time from Start (Hrs.).	0	¼	½	¾	1	1½	2	3	4
Methanol (95%), Ml.	Sulphur as CS_2 (% by Wt.).								
10·0	0·71	0·67	0·62	0·58	0·54	0·48	0·43	0·37	0·32
17·5	0·71	0·61	0·44	0·37	0·32	0·27	0·22	0·15	0·11
25·0	0·71	0·55	0·35	0·24	0·19	0·13	0·10	0·06	..
35·0	0·71	0·44	0·27	0·18	0·13	0·08	0·06	0·04	0·03
50·0	0·71	0·39	0·19	0·12	0·08	0·04	0·03	..	..

(5) *Effect of Temperature.*

The removal of carbon disulphide is accelerated by rise in temperature, since this increases both the solubility of the caustic soda in the methanol and the rate of the reaction, and temperatures of up to 35° or higher, according to the distillation range of the benzole treated, reduce somewhat the time of the treatment. The results obtained on treating a benzole containing 0·74% by weight of sulphur as carbon disulphide at temperatures between 0° and 40° are given in Table VI.

TABLE VI.

Benzole, 1,000 ml. Methanol (95%), 25 ml. Caustic soda, 6·5 g.

Time from Start (Hrs.)	0	¼	½	1	1½	2	3	4	5	6
Temp. (Mean).	Sulphur as CS_2 (% by Wt.).									
1·0°	0·74	0·68	0·61	0·49	0·40	0·33	0·25	0·18	0·12	0·09
10·5°	0·74	0·68	0·58	0·38	0·27	0·19	0·11	0·08	0·05	..
19·5°	0·74	0·47	0·33	0·16	0·11	0·08	0·06	0·04	..	..
27·5°	0·74	0·35	0·20	0·09	0·06	0·05	0·03	..	..	..
40·5°	0·74	0·20	0·10	0·05	0·02	..	..	..	..	..

When it is found that increasing the temperatures makes practically no difference to the quantity of sulphur removed in a given time, this is obviously due to restrictions imposed by some other condition. Thus, if it is found that the carbon disulphide is practically completely removed in 2 hours at ordinary temperatures, the same results will be obtained after treatment for this length of time at higher temperatures. Similarly, if the quantity of caustic soda used is insufficient, this will limit the quantity of carbon disulphide removed in a given time, irrespective of temperature.

(6) *Influence of Quantity of Phenols in Benzoles.*

From the results given in Table VII., it will be noted that the presence of 0·3% by volume of phenols does not materially affect the removal of carbon disulphide, although higher concentrations—*e.g.*, 1%, decrease appreciably the quantity of carbon disulphide removed by a given amount of methanol and caustic soda.

This makes it possible with many benzoles to dispense altogether with one aqueous alkali wash, since the excess caustic soda always present will remove any phenols during the methanol-soda treatment.

TABLE VII.

Benzole (free from phenols and pyridine bases), 1,000 ml. Methanol (90%), 40 ml. Caustic soda, 8 g. Temperature, 20°.

Time from Start (Hrs.)	0	¼	½	1	2	3	4
Vol. of Technical Mixed Phenols Added (Ml.).	Sulphur as CS_2 (% by Wt.) from Mean Curves.						
0	0·97	0·53	0·28	0·12	0·07	0·03	0·02
1	0·97	0·53	0·28	0·12	0·07	0·03	0·02
3	0·97	0·53	0·28	0·12	0·07	0·03	0·02
10	0·97	0·66	0·40	0·27	0·21	0·19	0·17

II. The Recovery of the Methanol and the Carbon Disulphide.

The aqueous methanol solution or residue run off from the benzole after addition of water contains sodium methylxanthate, free caustic soda, and sodium salts of acid impurities removed from the benzole. In addition, traces of hydrocarbons will be present, the amounts depending on the completeness of separation of the residues from the benzole, and on the solubility of the benzole hydrocarbons in the aqueous methanol. The latter decreases with increasing amounts of added water, and can readily be reduced to negligible proportions.

On keeping, the sodium methylxanthate in the residues gradually decomposes, the rate of this decomposition increasing as the free alkali present increases and with rise of temperature. Thus, residues that have been stored give less carbon disulphide and more hydrogen sulphide when treated with dilute sulphuric acid than the fresh residues. Moreover, residues containing large amounts of free alkali give more hydrogen sulphide and less carbon disulphide on acidification than residues containing only small amounts of free alkali. Although the precise nature of this decomposition is not known, the chief reactions are probably as follows:

(1) $NaS{\cdot}CS{\cdot}OMe + NaOH = MeOH + Na_2S + COS$.
(2) $COS + 4NaOH = Na_2CO_3 + Na_2S + H_2O$.

The decomposition of sodium methylxanthate with dilute sulphuric acid apparently takes place in a straightforward manner, according to the equations: (1) $2NaS{\cdot}CS{\cdot}OMe + H_2SO_4 = 2HS{\cdot}CS{\cdot}OMe$. (2) $HS{\cdot}CS{\cdot}OMe = CS_2 + MeOH$.

Although no difficulty has been experienced on the works scale in absorbing hydrogen sulphide and other obnoxious gases, it is desirable to decrease to a minimum the quantity produced. In order, therefore, to obtain the maximum recoveries of methanol and carbon disulphide and to avoid the production of obnoxious gases, the following precautions should be taken: (1) The concentration of free alkali in the residues should be kept as low as possible. (2) The residues should be neutralized as soon after production as possible. (3) The residues should be kept cool during neutralization, and the sulphuric acid should be fairly dilute and should be added slowly. (4) Sufficient acid should be added to the residues to ensure that the decomposition of the sodium methylxanthate is complete.

If the residues have previously been sufficiently diluted with water, the carbon disulphide may be run off when neutralization has been completed. The carbon disulphide thus obtained is usually almost black in colour and contains free sulphur. Alternatively, if the neutralized residues are fractionated, as described below, the carbon disulphide with a little methanol passes over first, a constant-boiling mixture (b.p. 37°) containing 87% by volume of carbon disulphide being formed. This fraction is collected under water, when the methanol dissolves and the carbon disulphide sinks to the bottom as a light yellow or colourless oil. On continuing the fractionation, no difficulty is experienced in obtaining practically the whole of the remaining methanol in high concentration.

Works Practice.

(1) *Treatment of the Benzole.*

Large-scale trials have shown that there is no difficulty in recovering the methanol at a concentration of at least 95%, so that it is unnecessary to consider treatment of the benzole with methanol below this in concentration.

The best relative proportions of methanol and caustic soda to use in practice will be governed largely by economic considerations. Unless a high recovery of methanol is being obtained, the total cost of the methanol and caustic soda used for removing a given amount of carbon disulphide decreases within limits as the ratio of caustic soda to methanol increases. Hence, under these conditions, it is more economical to use a high ratio of caustic soda to methanol. This ratio will be governed by the following considerations. There is a certain limiting ratio of caustic soda to methanol beyond which little saving in methanol is effected; moreover, too high a ratio leads to certain practical difficulties, such as the danger of blockages caused by deposition of solid caustic soda, and the resinification of the unsaturated constituents of benzoles with subsequent emulsification difficulties.

TABLE VIII.—*Quantities of Methanol and Caustic Soda Required for the Removal of Varying Amounts of Carbon Disulphide from 1,000 Gallons of Benzole.*

Sulphur as CS_2 in Benzole (% by Wt.).	Sulphur as CS_2 to be Reduced to 0·1% by Wt.	
	Vol. of Methanol at least 95% Concn. (Galls.)	Wt. of Flake Caustic Soda (Lb.).
0·2	10	16
0·3	18	25
0·4	23	35
0·5	27	41
0·6	32	49
0·7	37	56
0·8	42	63
0·9	46	70
1·0	50	76
1·5	74	112
2·0	90	150
3·0	130	210
4·0	170	265
5·0	200	310

THE DIRECTIONAL REFLECTION OF RADIANT HEAT

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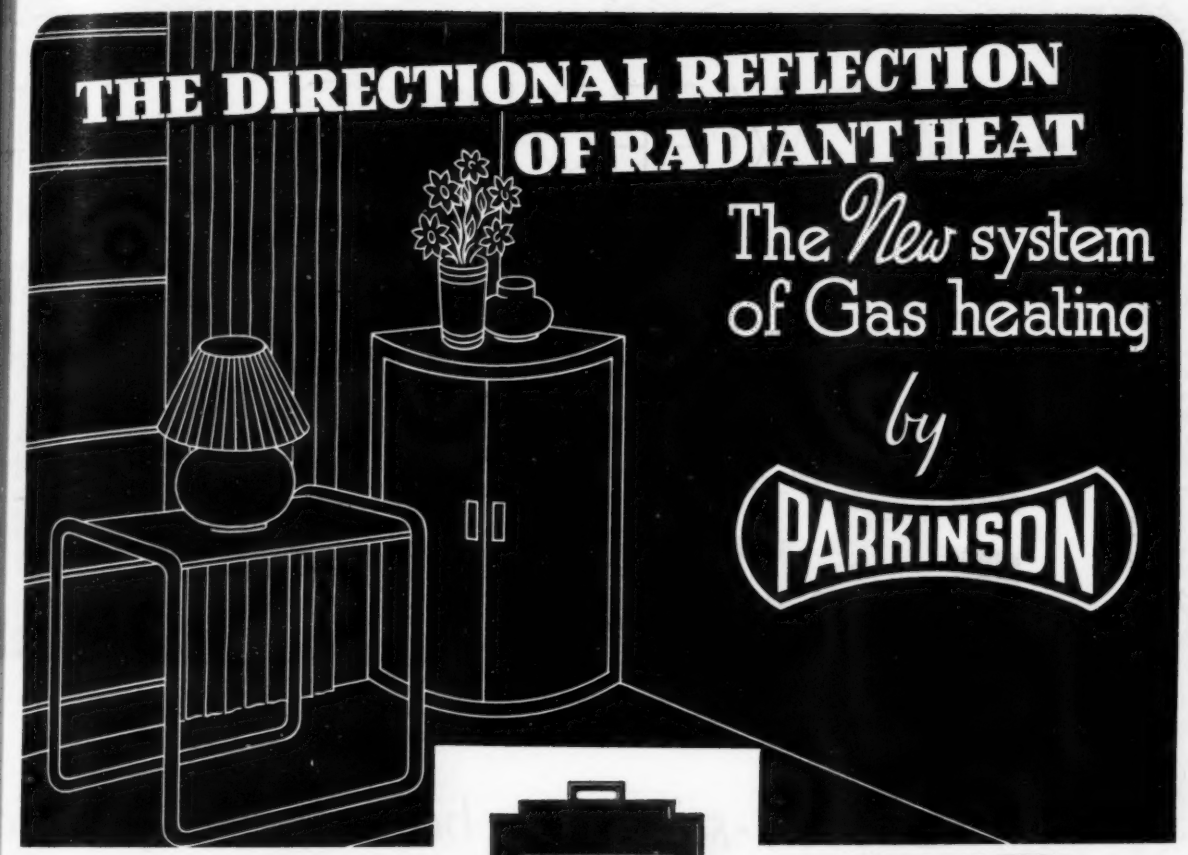

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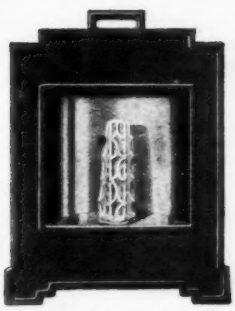

The PARAVEX *Portable* Gas Fire

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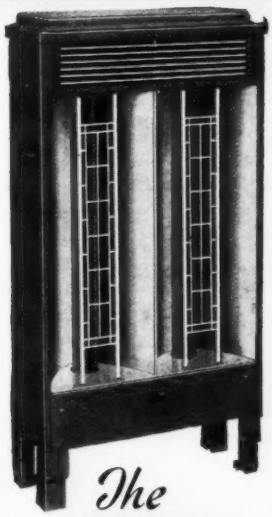

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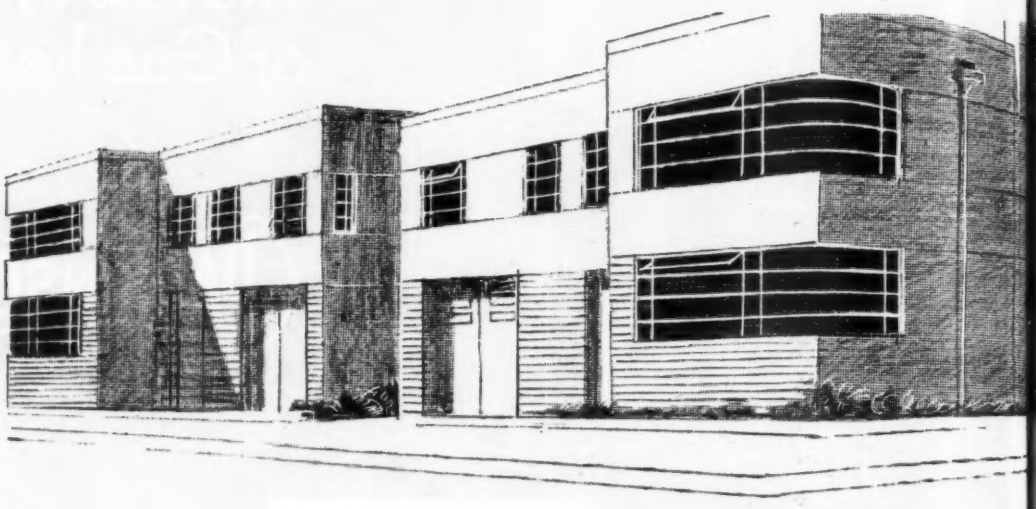


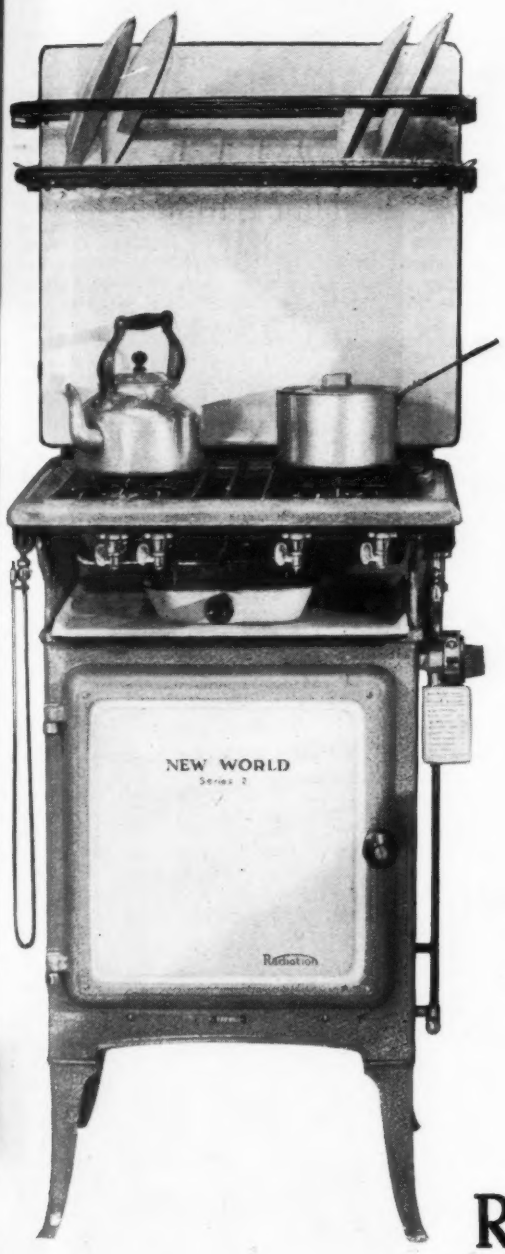
Labour-saving — beautiful — practic

The "New World" with the "Regulo" oven-heat control completes even the most ultra-modern of the new homes. Where the Public is concerned, Gas is first choice for cooking every time, and the confidence that the "Regulo" has built up over eleven years is the industry's strongest assurance of continued preference. Colossal "New World" sales made possible ever-improving methods of manufacture and testing. Like the bicycle that must keep on moving to preserve its upright position, Radiation is sparing no effort or expense to maintain the lead for the "New World."

NEW WORLD

Regulo-Controlled Gas Cooker

THE MODERN HOME



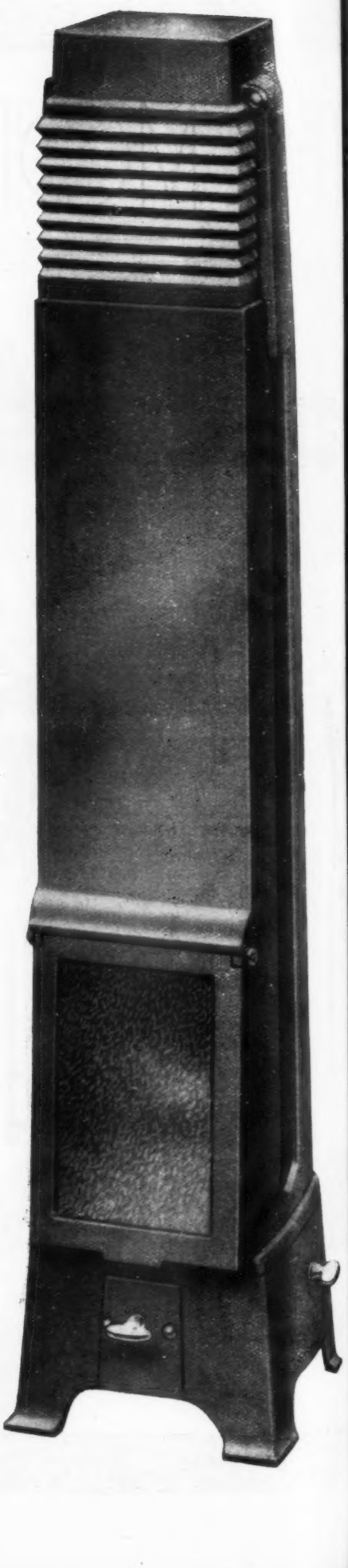
The REGULO Control

The "Regulo" automatic oven-heat control, together with the principle of oven design developed by Radiation Ltd., has come through the most exacting tests with added strength. The accuracy and reliability of the "Regulo" have extended the use of the oven in cooking, enabling the economy of automatic control to be applied in many new directions with entire success.

Radiation

The Cannon "Beacon" Radiator represents the high-water mark in gas radiator design and practice. In appearance it is distinctively modern, yet will harmonize with any scheme of architecture or decoration. Its heating qualities are exceptional. No heat whatever is wasted. No flue connection is required. The "Beacon" may be obtained in one, two, or three column units (with or without boiling burner) and in two lengths of column.

Sole Manufacturers: Cannon Iron Foundries, Ltd., Deepfields, Nr. Bilston, Staffs. London Office and Showrooms: Thames House, Westminster, S.W. 1.



CANNON

Normally, however, the methanol will be recovered from the residues, and the higher the efficiency of recovery of the methanol, the more economical it becomes to decrease the quantity of caustic soda towards the theoretical amount and increase the quantity of methanol used. In practice, the net consumption of methanol does not exceed 10% of the quantity used for treating the benzole.

On works recovering at least 90% of the methanol at concentration of not less than 95%, the quantities of methanol and caustic soda given in Table VIII., according to the amount of carbon disulphide to be removed, should give satisfactory results. These figures, which have been drawn up from a large number of semi-technical and large-scale tests, are for treatment of the benzole in the usual type of benzole washer at a temperature of 15°, and should effect the specified reduction in carbon disulphide in less than 3 hours. It is assumed that the benzole is free from suspended water, and that agitation is sufficiently vigorous to ensure intimate contact between the two layers. A reduction to less than 0·1% can be effected by prolonging the time of agitation or increasing somewhat the quantities of methanol and caustic soda.

Adjustment of the quantities of methanol and caustic soda used will be necessary if the temperature varies from that specified and depending on the efficiency of the washer. In any case trials should be carried out on each works in order to check the exact quantities that will give the desired results at the lowest cost.

It has been found best to give the wash with methanol and caustic soda after any acid-treatment of the benzole. The spent acid is separated, and the benzole is sprayed with water and neutralized with alkali or soda ash. No treatment of the benzole with alkali prior to the acid wash is necessary unless the benzole contains hydrogen sulphide or a phenol content appreciably above 0·3%. Where the benzole does not fulfil these requirements, a very light alkali treatment is all that is necessary, considerable savings being effected over the quantity of alkali normally used.

After separating any water as completely as possible, the methanol is added to the benzole and the stirrer set in motion. The caustic soda, which should be in flake or powdered form, is then added and stirring continued until the desired reduction in carbon disulphide has been effected, when a volume of water equal to that of the methanol originally used is added while the stirrer is still in motion. After a further 5 minutes, the stirrer is stopped and the contents of the washer are allowed to settle. The aqueous methanol-soda residues are then run off, but a quantity of methanol of the order of 20% of that originally used may be left in the benzole. This methanol can be removed with one or two water washes—*e.g.*, about 90% of this methanol can be removed with two washes each with 5% of water. The last traces of methanol may be recovered if desired during the subsequent distillation of the benzole, as they will collect in the water from the water separator. The dilute methanol thus obtained is worked up with the bulk of the residue.

(2) *Recovery of the Methanol and Carbon Disulphide.*

The neutralization of the residues is best carried out in a closed vessel, which should preferably be lead-lined and should be provided with a cooling coil and stirrer. In order to prevent any escape of hydrogen sulphide or carbon disulphide, a vent is connected to two small scrubbers, the first containing aqueous caustic soda and the second a solution of caustic soda in methanol.

The quantity of sulphuric acid required for neutralization is that necessary to convert all the alkali originally used into sodium sulphate. When mixed residues are being treated, the quantity of acid required can easily be determined by testing a sample in the laboratory. A known volume of residues is boiled with excess of sulphuric acid until decomposition is complete, and the excess acid back-titrated with caustic soda, which has been standardized against the sulphuric acid.

The following is a convenient method of decomposing the residues. The acid used should be about 25% by weight in concentration. It should be added slowly to the residues, with agitation, care being taken to keep the temperature below 25°. In order to ensure that decomposition of the xanthate is complete, excess of acid should be added and the residues finally neutralized by the addition of soda ash, thus avoiding any corrosion of the still used for the subsequent fractionation. Sodium sulphate may separate from the neutralized residues on keeping, and therefore they should be transferred at once to the still.

The still should be fitted with an efficient fractionating column and an analyser. Adequate condensing arrangements should be provided, and should be so designed as to avoid liquid being held up, otherwise the carbon disulphide distilling over in the first fraction will be trapped and, being heavy and partly miscible with the methanol, will contaminate it at a later stage of the fractionation. Three receivers are required. The first is used for carbon disulphide, which will amount to about 5% by volume of the residues before neutralization. This receiver should be fitted with an inlet pipe reaching nearly to the bottom, and should contain sufficient water to seal this pipe. The second is used for methanol of high concentration (Grade A), ready for further treatment of the benzole, and the third for methanol of lower concentration (Grade B). The vents to all three receivers should be connected to the scrubbers for absorbing hydrogen sulphide and carbon disulphide.

On starting up the distillation, the methanol-carbon disulphide constant-boiling mixture begins to distil over at a temperature of about 36°. If any traces of benzole have been left in the residues, most of this benzole will distil over between 50° and 60°, and the distillate collected between these temperatures should be diverted into the Grade B methanol receiver. At 60°, the distillate is changed over to the Grade A methanol receiver and collected until the temperature reaches 80°, when the distillate is again diverted to the receiver for Grade B methanol. Above 80°, the temperature usually rises very rapidly, and the distillate is collected until its gravity has increased to unity. If the distillation is carried out with a fairly high reflux ratio, no difficulty should be experienced in recovering about 90% of the original methanol as Grade A in 95 to 98% concentration. This methanol has been found to be quite satisfactory for treatment of benzole, although it contains compounds that have a peculiar and somewhat unpleasant odour. These impurities, however, act as an effective denaturant. The concentrations of the Grade A and Grade B methanol are readily determined from their gravities.

The aqueous layer from the carbon disulphide receiver is added to the receiver for Grade B methanol, the water causing the separation of any benzole collected in this receiver. The aqueous methanol from Grade B receiver is returned to the still for refractionation with the next batch of neutralized residues, and the benzole returned to the benzole storage tank.

The still residues consist principally of an aqueous solution of sodium sulphate with small quantities of resins and other impurities removed from the benzole. Although sodium sulphate may separate from the neutralized residues, no separation occurs from the still residues, because this salt is much more soluble in water than in aqueous methanol. Usually the still residues have a somewhat unpleasant odour, but insufficient to cause any objection when run to waste.

Clearly the costs of the process depend on the prices at which methanol and caustic soda can be obtained and the efficiency of recovery of the methanol, and these costs will be considerably reduced where there is a market for the carbon disulphide or the xanthate.

Sugg's New Public Lighting List

In view of the immense importance which directional reflection has assumed in public lighting, Messrs. William Sugg & Co., Ltd., of Westminster, make no apology for giving the subject pride of place in their new Catalogue of Public Lighting—List 12.

In the new order of things under which public lighting contracts are placed on the basis of illumination provided, not at the situation of the lamp, but often at a point many yards from it, directional reflection is a factor at least as important as the source itself. Messrs. Sugg's have not forgotten, however, that the high duty and correct functioning of the lamp, which are only obtained by the finest workmanship and materials, are still considerations of the first order. Each lamp described in the catalogue has been expertly designed for a specific purpose.

First in the system of intensive reflection employed comes the "London" lamp which was described in the "JOURNAL" for Feb. 27, 1935; then their "Directional" reflector in its various forms consisting of multiple parts of rustless steel; the "Multi-ray" series which fits admirably many public lighting purposes; and finally some of the "Holophane" products which give excellent results with these lamps.

Other lamps mentioned in the list include the "Rochester" which has recently gained prominence in many schemes of improved lighting, the "Promenade"—claimed to be absolutely weather-proof—and the "Windsor." The chromium-plate complement to smart modern shop-fitting, the "Arcade," is a particularly smart production. Other lamps for this purpose are the "Piccadilly" and the "Parade" which has an adjustable hinged back screen to carry advertising matter.

The catalogue is of handy size and, as well as dealing with lamps, reflectors and refractors, and columns, gives details of conversion sets, burners, mantles, and many other public lighting accessories.

Gas Refrigeration

A Paper presented at the Annual Meeting of the Irish Association of Gas Managers in Dublin on Aug. 13.

by
J. P. MORRISON

Let us for a moment consider refrigeration in general. Refrigeration does not necessarily mean freezing, but the absence of heat. We know that food deteriorates very rapidly when stored in a warm, moist atmosphere. Therefore, if the housewife can store her food in a cool, dry atmosphere she is then in a position to serve her family with good food with a minimum amount of waste. The question now arises in our minds, is refrigeration necessary in this country? It is an accepted fact that the danger line of food storage is 50° F. In 1932 a Belfast firm, J. Sharman D. Neill, took a record of outside temperatures, and this record shows that only on 15 days of the year is the temperature under 50°; 1932 was just an average year, and we are, therefore, in a position to state that there is in this country a definite need of refrigeration as far as temperature is concerned. We also agree, I think, that we have a good moisture content in the air. This proves that there is a definite market for refrigerators.

Necessity of Refrigeration.

To show that domestic refrigeration is a necessity and not purely a luxury, we have considered the essentials for hygienic food storage in the home. These are:

(1) A temperature below 50°.
(2) Adequate air circulation.
(3) A compartment which is dust, damp, and germ proof.

If no domestic refrigerator is installed, the food is kept either in a larder, cellar, water-cooled meat safe, or ice box, and none of these methods conform to any of the three essentials mentioned. The gas operated refrigerator is designed to maintain a temperature safely below 50° F. at all times. Air circulation is provided automatically, and the cabinet is entirely dust, damp, and germ proof. It is, in fact, the perfect cold controlled larder.

The importance of refrigeration to the consumer can be summarized as follows:

(1) Food maintained in a healthy and palatable condition.
(2) Elimination of waste of food.
(3) Simplification of buying and storing food.
(4) Ice cream can be made.
(5) Ice available for iced drinks, &c.

The Importance to the Gas Industry.

(1) A steady 24-hour-day all-the-year-round load, with an immense increase in the summer months.
(2) An attractive use of gas of publicity and prestige value.
(3) Prevention of the introduction of electrically operated refrigerators.

I will give you a few facts regarding the very rapid growth of gas refrigerator sales, both in America and England, during the past eighteen months, and show how it is possible to accomplish the same end in the Irish Gas Industry.

First of all, we have to admit that in the minds of the public, refrigeration, up to a short while ago, has definitely been linked with electricity, due mainly to the fact that the electrical industries were quick to link up refrigeration with their product when domestic refrigerators were first introduced. For some years electric refrigeration held full sway in America, and it was not until the American Gas Industry adopted up-to-date speciality sales methods that the tide turned. *Last year, 40% of the domestic refrigerators sold in New York were gas operated,* and it is confidently expected that this figure will be greatly increased in 1935. When one considers that New York is probably the most modern city in the world and has, in addition, very cheap electricity, it becomes obvious that gas is considered to be a superior means of obtaining refrigeration in the home by a very large proportion of Americans.

The refrigerator load in the American Gas Industry is almost as large as the cooker load. So far as London is concerned, very rapid strides are being made by the Gas Industry generally.

Taking the Gas Light and Coke Company as an example, we find that sales in 1933 in their area of supply were only 290 cabinets. In 1934, by adopting up-to-date sales methods, sales were increased to 1,500 cabinets. In the first half of this year, over 5,000 refrigerators were sold, owing to the use of extended hire purchase terms covering five years with free maintenance, backed by an extensive advertising campaign and co-operation with our trader distributors. The refrigerator salesmen employed by these trader distributors are permitted to sell cabinets on the Gas Light and Coke Company's five-year terms. The sales staff of the Gas Light and Coke Company were averaging 150 refrigerator sales per day for several consecutive months during the summer. Now the sales are 300 per day.

In 1934, in the area of supply covered by the Gas Light and Coke Company, 50% of the domestic refrigerators sold were gas operated, and this year it will probably be nearer 80%. Large increases are recorded from other parts of England, and in some districts the increase in sales of gas operated refrigerators is as much as 300% over last year.

Refrigeration-Minded.

Outside London last year, only 5% of the refrigerators sold were gas operated. This year the proportion is over 50%. Gas operated refrigerators sold in Ireland last year was 0·04%, and this year appears to be smaller. From the foregoing it will be realized that the public are rapidly becoming refrigeration-minded and that there is a very large market for domestic refrigerators. It is up to the Irish Gas Industry to see that they get their full share of this business. This can be done by fixing *five years'* hire purchase terms and letting consumers know that they can purchase a gas refrigerator for as little as 1s. 9d. per week.

An inexpensive method of doing this is by enclosing a slip giving details of the hire purchase terms with the quarterly gas accounts. A better method is by Press and poster advertising, stressing the weekly cost. Cabinets displayed in gas showrooms should have a showcard pointing out that the refrigerator can be obtained for as little as 1s. 9d. or 2s. 6d. per week, according to the size of cabinet on display.

Payment of a small commission or bonus to all sales staff, fitters, &c., has been found to be very successful in increasing the sales of appliances by some gas undertakings.

The main thing is to make certain that consumers are informed that they can buy a refrigerator from their gas undertaking in the same manner and on similar terms to those on which they buy their gas cookers, &c. Treat the refrigerator in the same way that you treat other gas appliances and good sales will result. A very large proportion of the public want a refrigerator—thanks to the advertising by the electrical industry—and the Gas Industry can supply this want by making it easy for them to buy.

The gas refrigerator has now reached the stage where it merits your serious consideration as a load building factor. It is no longer looked upon as a toy to be experimented with. We now have a product which is efficient, attractive, and in increasing demand. The time is not far distant when a house or flat without a refrigerator will be considered as old-fashioned, as would be a house without a bathroom to-day.

During the next two or three years the domestic refrigerator market will be very active. I know that you, as gas engineers, will want your industry to have the lion's share of this market.

Discussion.

Mr. H. W. Saville (Wexford) proposed a hearty vote of thanks to the author, and remarked that personally he had only been able to touch the fringe of the subject of refrigeration. His difficulty had not been in selling the appliances, but in getting hold of them. The agency question had presented a difficulty. However, any he had put in had been a tremendous success. He had been bombarded on the subject by his showroom staff, and it was evident that there had been enquiries. He would be quite willing to take up the matter seriously, if he could get suitable terms, and he hoped this Paper would be the beginning of better things.

Mr. J. A. Pemberton (Sligo) said the Company he represented were appointed agents by the refrigerator people, and the gas-operated refrigerators he had in his district had proved very successful. His gas was 450 B.Th.U., and he kept a fairly straight line. The consumption necessary to keep the refrigerators below 50° averaged 0·6 cu.ft. per hour. They were very satisfactory in every respect.

Mr. F. J. Edmonds (Waterford) asked how the small gas undertakings were to place this load before the public, when the refrigerators were so expensive. Small undertakings could not invest large sums of money on the chance of the appliances being sold. They required support from the manufacturers

similar to that which they received from the makers of other gas appliances. With this assistance, he thought they would get a remunerative load. The whole thing rested with the refrigerator makers. They should place before the Gas Industry proper terms, and not expect the Gas Industry to "carry the baby."

The PRESIDENT thanked Mr. Morrison for his Paper, and asked him to give a demonstration with a refrigerator that had been fitted up in the meeting hall.

Mr. MORRISON, replying to points that had been raised in the discussion, said he was sorry if any gas manager had been under the impression that he had to buy refrigerators through an agency. His Company exempted the Gas Industry, who could deal direct with Electrolux. He was, of course, not in a position to discuss the Company's policy as regarded terms; but he might say that in Dublin they carried large stocks, and the Gas Industry need not be afraid that they would be unable to get delivery of any apparatus they might order. He thought he might say that his firm had done everything possible to give the Gas Industry a backing; but while the business was starting to work up in England and Northern Ireland, so far as the Gas Industry of the Free State was concerned things had been anything but encouraging as regarded refrigeration.

Care and Maintenance of Gasholders

by P. C. BOOTH

A Paper presented at the Annual Meeting of the Irish Association of Gas Managers in Dublin on Aug. 13.

In preparing this Paper I did not consider it necessary to mention every detail which has attention during a proper inspection, or to describe the consecutive steps of any particular method of inspection. I have no doubt you are all conversant with the First Report of The Institution of Gas Engineers' Gasholder Sub-Committee, 1932, when details were published of the minimum inspections required to ensure, as far as possible, that holders are kept in a free and safe working condition.

Further, I do not intend to criticize any particular design of holder or component parts. I spent many years with the gas plant manufacturers of England, and am quite satisfied that they can hold their own against the rest of the world. The common aim of the gas plant manufacturers, in my opinion, is identical with that of the gas engineer—plant efficiency. Care of gasholders commences when the holder is being installed, and should be continued right through the final stages of completion.

I will mention a few of the essential points which should be carefully watched during construction.

Water-Sealed Holder in Steel Tank.

After the tank bottom and first round of side plates have been assembled, riveted, and a satisfactory water test of the tank bottom completed, the concrete raft or foundation should be cleared and covered with a layer of clean sand, to a depth slightly in excess of the rivet heads on the underside of the tank bottom. This will ensure an equal bearing of the tank bottom plates and prevent any undue strain on the riveted joints when the tank is filled with water.

When the tank bottom is being lowered to foundation it is advisable to place steel packings about ½ in. thick below the rivet heads of the bottom curb at equal distances of about 8 ft. to 10 ft. By doing so it allows free movement of the tank bottom caused by expansion and contraction, and also prevents the tank bottom plates from buckling to a great extent when the sun is playing on the plates.

It is not always practicable to level the tank bottom immediately it has been lowered to foundation, owing to its flexibility. During the time the remainder of the tank side plates and tank balcony are being erected and riveted, the high and low points at the bottom curb will often reveal themselves. It is a simple matter to raise the low points by driving steel wedges between the bottom curb and foundation, or to lower the high points by removing the steel packings. The final levelling of a steel tank should take place after the holder has been completed and all lifts and tank top adjusted and spaced correctly. The top curb of the inner or top lift can be relied upon with a fair amount of accuracy to form a true circle. All other lifts, including the tank top, can be suitably adjusted to the inner lift.

Before the tank is filled with water, the sand round the tank bottom curb should be rammed tight underneath. Afterwards, sand should be withdrawn from below the bottom curb. This space should then be grouted in with a good mixture of sand and cement. This will ensure an equal bearing of the tank bottom curb and will also seal the tank bottom, making it air and water tight when the tank is carrying the full head of water.

Before water enters the tank, the inlet and outlet pipes should be tested with the full head of water and allowed to stand at least 24 hours, when an inspection can be made for leaky joints and valves. All cups should be tested for leakage. The clearance between cup skirting plates and outer lift vertical stays should be checked. This is more essential on a spirally-guided gasholder where there are no bottom guide carriages. Levels of the rest blocks should be taken to ascertain that each rest block is taking its required load when the holder is at rest. Rest blocks should be anchored to the tank bottom, especially on spirally-guided holders.

All inward buckles in side sheeting should also be removed before the tank is filled with water. It has often been suggested that slack inward buckles will disappear when the holder is inflated, due to pressure. This may be correct in some cases, but it must be remembered that the buckles are likely to reappear when the lift comes to rest. I have in mind a case where leakage appeared on the sides of one of the outer lifts of a holder. Internal corrosion was suspected and it was then decided to renew the affected sheets. Examination of the first sheet revealed deep vertical grooving caused by rivet heads in the cup skirting plates rubbing on the side sheeting, this being due to inward buckles forming when the lift was at rest.

Maintenance.

It is advisable to lubricate all carriages weekly, but in no case should lubrication be deferred beyond one month. During this operation all rollers and axles should be inspected. Disengaged rollers should be turned round by hand. Any rollers found to be seized up should be released immediately or the particular rollers recorded in the gasholder book for further attention.

Examination of Cups.

It is advisable to measure the depth of water in the cup seals at the weakest point—*i.e.*, the high side of the holder. This should also be recorded. This is essential with aged holders, where cup leakage may develop. All cups should be cleaned out and examined periodically. It is generally recognized that the cup wind and water line and the tank wind and water line are more subjected to corrosion than other parts; but I have found in a good many cases, where the wind and water line has been in perfect condition, at the same time serious corrosion has taken place well below the wind and water line.

The sheeting below water should, therefore, be thoroughly cleaned and examined annually. The best method of carrying out this operation is to lower the holder to uncupping point, when the water can safely be removed from the cup. This method, of course, is not practicable with all undertakings owing to lack of storage room and inadequate pressure. In this case the holder should be brought down as low as conveniently possible, when a quantity of water can be syphoned from the cup. The depth of water syphoned from the cup will be determined by the gas pressure in the holder. Take, for instance, a two-lift holder throwing a pressure of 6 in. when cupped. It would be quite safe to syphon the water out of the cup until 8 in. remain. The side sheets and dip skirting plates could then be thoroughly cleaned and examined. The remaining portion of sheeting below water can quite easily be scraped and examined by groping with the hand. It is advisable to select calm and dry weather for this operation, when the affected sheeting can be thoroughly cleaned and painted. There are a number of grease paints for the protection of cups and dip skirting plates.

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Side Sheeting.

Examination of side sheeting is not very difficult when holders can be deflated to the last or top lift. When painting is contemplated, plenty of time should be spent on cleaning the surface of the sheets so that all loose and blistered paint and corrosion can be removed. Thorough cleaning of the whole surface of the side sheeting provides the best opportunity of inspection. During this operation defective parts are likely to reveal themselves, and if leakage is taking place suitable patches can be fixed. All corrosive pitting and grooving should be thoroughly cleaned and treated with red and white lead paint. This should be allowed to dry thoroughly before the final coat of paint is applied.

A number of isolated patches on side sheeting does not necessarily interfere with the safe working of the holder, but continuous patching along the wind and water lines and along riveted seams gives cause for some concern. It must be understood that the patches fixed under pressure with the type of repair bolts in common use do not strengthen the weak parts. Such patches are fixed to prevent the loss of gas only. If leakage takes place on the side sheeting at a point along the inner lap while the external condition of the side sheeting still appears to be reasonably good, an internal inspection is then very desirable. It will often be found that internal corrosive grooving has taken place at a point close to the edge of the inner laps.

Crown Sheeting.

Special attention should be paid to the crown sheeting, which should be thoroughly cleaned and painted every year, all cracked and blistered paint being thoroughly scraped off. The underside of the crown sheeting is often found to be affected by corrosion to a greater extent than the side sheeting. Internal inspection of the crown sheeting not infrequently reveals serious corrosive wasting and deep pitting, possibly set up by moisture clinging to the sheeting due to evaporation of the tank water. Here again, if leakage appears in a number of places while the external surface of the sheeting appears to be good, I would strongly advise that the holder be put out of commission and an internal inspection of the crown sheeting made. At the same time a sample of the metal should be taken from the crown for testing purposes. Excessive patching of the crown sheeting is a dangerous practice and tends to weaken rather than strengthen the affected parts.

Steel Tanks.

Periodical inspections of the tank at wind and water line should be carried out, and if corrosion is taking place the water in the tank should be lowered sufficiently to allow for thorough cleaning and painting at this point. As mentioned in connection with the cups, it is advisable to grope down the tank sides as far as possible by hand to ascertain if there is any pitting taking place. Tank water should be analyzed periodically for corrosive matter.

Where steel tanks are partly buried below ground, it is advisable to remove the earth and puddle clay in a number of places, with a view to inspecting the condition of the side plates. The earth should be removed from the ground line to a depth of at least 6 in. Often you will find corrosion has taken place at this point. The affected parts should be thoroughly cleaned and painted. Inlet and outlet valves should be operated periodically to ascertain their freedom and tightness when closed. By keeping the valves working freely you are able to isolate the holder in case of accident.

Water overflow pipes in tanks should be extended down the inside of the tank to a depth of 2 ft. from the bottom. By this method the polluted water is displaced by clean water during rainy weather. The top of the overflow pipe, of course, must have an open end to prevent any syphoning.

Guide Framing.

Guide framing should be inspected annually, when all rust and scale should be removed. It is dangerous to allow rust and scale to accumulate in confined spaces on lattice columns and girders, or between columns and guide rails. This often causes bulging of the structure and column guides, and breaks the connecting bolts and rivets.

Columns and guides should be plumbed for alignment periodically and particulars of the plumbings recorded. It is essential to examine the bolts connecting the girders to columns and wind ties to columns. It is often found that the head and nut of the bolts are in perfect condition, these having been protected by paint, while at the same time the shank of the bolt has corroded seriously. I have come across $\frac{7}{8}$ in. bolts wasted to such an extent that the remaining metal has been less than $\frac{1}{4}$ in. in diameter. It it advisable to take several bolts out occasionally for inspection.

Water should not be allowed to accumulate in cast iron columns. This has happened in many cases and has resulted in columns having cracked due to formation of ice in frosty weather. A drain hole at the base of the column will remedy this matter.

Brick Tanks Below Ground.

In many cases the top of a brick or concrete tank is flush with the ground. I would strongly advise that a coping be fixed round the tank 9 in. or more in height. This will prevent spent oxide and coke dust, &c., from blowing or washing into the tank during windy and rainy weather. Holders have been seriously damaged by the tank water becoming polluted with these elements.

Where holders are seldom grounded it is also advisable to search the rest blocks before allowing the holder to land. Serious damage has been caused to lifts due to bulky articles accidentally dropping in the tank and becoming lodged on the rest blocks. A suitable tool for searching the rest blocks can be constructed from $\frac{3}{4}$ in. or 1 in. steel tubing.

The tank guide rails should also be searched. Sections of guide rails have been known to come adrift and lean outwards sufficiently to foul the bottom curb and tilt and capsize the holder. A suitable tool can also be made for this purpose which will give you some bearing as to the state of the guides.

Prevention of Ice in Cups and Tanks.

Where steam is available, suitable anti-freezers should be fixed to prevent ice forming in the cups and tanks. These should be fitted with non-return valves to prevent water syphoning when the steam is shut off or in the event of a burst pipe. Syphoning, of course, cannot take place to any great extent if the steam jets or circulators are fixed in the correct position 1 in. to $1\frac{1}{2}$ in. below water. In some cases the steam jet has been found to extend 6 in. to 7 in. below water surface. This is a dangerous practice because of the risk of heavy syphoning.

Care should be taken to prevent ice forming on the tank water inside a spirally-guided holder. This occurred in a number of cases during the severe frost of 1929, when serious damage was caused to the inlet and outlet stand pipes inside the holders, resulting in the flooding of mains and failure of gas supply. In one case the holder collapsed, and had to be dismantled and re-erected. As you are aware, a spirally-guided gasholder rotates at an angle of 45° during inflation and deflation. This causes a slab of ice inside the holder to rotate and break the joints of the inlet and outlet pipes.

When steam is not available, oil filming will reduce ice formation in the cups and tank to some extent. To oil film the cups it is necessary, of course, to fix an approved syphon.

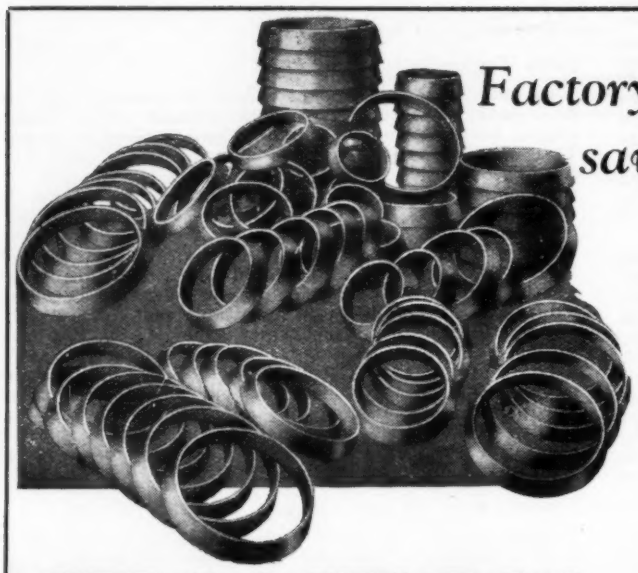
Adjustment of Carriages and Levelling of Holders.

Holders can be levelled in most cases by the correct adjustment of carriages, except in a case where the tank or column guides are out of level due to subsidence. Where subsidence has occurred it is advisable to empty the tank and level all rest blocks. It will also be necessary to level the tank carriage bedplates on a spirally-guided holder. If the column alignment is at fault it will be necessary to have the column guides reset.

Most of the large gas undertakings are in a position to employ a fully qualified mechanic who is able to deal with adjustments to carriages and levelling of holders. I do not propose to outline any particular method of adjustment, because for explanatory purposes the case of each holder must be treated individually, but we can take a column-guided holder when the guides are in true alignment, but the holder is tilting to a certain extent.

The tilt will undoubtedly be due to wear and tear of the carriage rollers, axles, and guide rails. The carriages will, in all probability, appear to be bearing hard on the columns at the low side of the holder while they will be clear of the guides on the high side. In such a case it would be quite wrong to ease the carriages on the low side by moving them inwards. This would simply allow the holder to tilt further over. The proper method to adopt is to lower the holder until the top lift only is floating. The lift can then be pushed over until the carriages become engaged on the opposite or high side. The lift should then be practically level, and while held in this position the carriages on the original low side should be brought outwards. Immediately the second lift is cupped and raised from the rest blocks, it will be found necessary to make an adjustment on this and any additional lifts.

All bottom curb carriages should be examined periodically when the holder is fully inflated and their condition recorded. The bottom or cup carriages of the inner lift can only be examined by an internal inspection, but a fair estimate of their activities can be ascertained by the use



Factory-made Lead Rings save time in the Trench!

More easily handled than molten lead, a pre-cast lead ring also makes a more efficient lead joint. To assemble the Stanton Mechanical Lead Joint, a factory-made lead ring is pushed over the pipe spigot, and two half-collars are placed into position. The operation is then completed by the tightening of four cast-iron setscrews—no caulking is necessary.

Embodied in the lead ring is a steel spring insertion ring which distributes the pressure so that the joint is effective throughout the full depth. The ring is positively held in position and cannot shrink, loosen or be displaced by "drawing" of the spigot.

Patent No. 404955, other patents pending

STANTON MECHANICAL LEAD JOINT

The Stanton Ironworks Company Limited, Near Nottingham

By Appointment
Ironfounders to H.M. the King.

For Housing Schemes, Bungalows, Flats, etc., Offer

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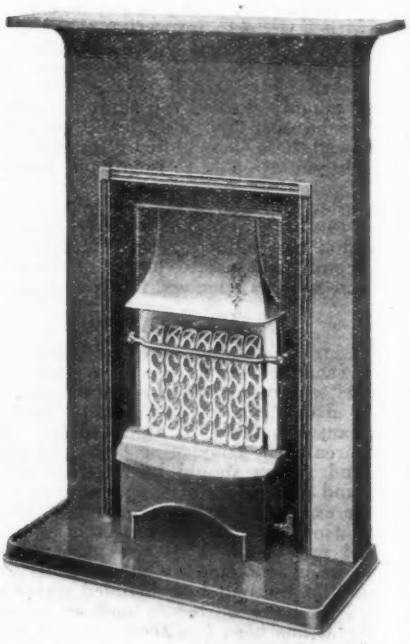

No. 1145G Gas Mantel Register Grate.

of a sensitive listening instrument when one can usually determine the number of carriages engaged.

Adjustment of Spiral Guide Carriages.

This is rather a difficult proposition. One must study the position of the carriages before moving those suspected of binding or being overloaded. It is quite easy to release a spiral carriage, but it may result in throwing extra load on the carriages on either side of the one released and put further strain on those carriages diametrically opposite. Unless one is accustomed to this work it is advisable to call in a fully qualified person.

Levels of Holders.

Levels of holders should be checked periodically. Vertical measurements should be taken from the top of the dip to water level in the cup at least four points. Horizontal measurements from edge of dip to side sheets should be taken at the same points.

Measurements should also be taken from the top of the tank to the water level, and edge of the tank curb to outer lift side sheeting. Particulars should be entered in the gasholder log book and figures of last reading compared with the previous figures. On spirally-guided holders one can reasonably expect a certain amount of variation in vertical measurements, because holders of this type tilt slightly due to prevailing winds.

Oil Filming.

Internal oil filming of holders is an advantage. Besides preserving the side sheeting it reduces the evaporation of the tank water as well as assisting in preventing ice forming inside the holder during frosty weather. When holders are regularly cupping and uncupping, it is impossible to keep the oil locked inside the holder. Each time the holder uncups a quantity of oil is released, and eventually the outer surface of the side sheeting becomes coated. External oil filming becomes very unsightly and objectionable in built-up areas. I would not advise oil filming of aged gasholders where patching has taken place.

Filming paint is now being adopted in this country, and from the experience I have had with this method it appears to be giving satisfactory results in preserving the sheets, but, like oil filming, it is apt to emulsify with the rain and tank water, but not to the same extent as oil filming.

Preparation for an Internal Inspection.

When an internal inspection is contemplated it is advisable to take precautions. Stated briefly, these are as follows:

After the holder has been lowered and gas is released from the crown, the underside of the crown should be steamed for several hours. Steam will remove any gas which may be lurking in pockets about the crown sheeting and crown framing. The best method of carrying out this operation is to raise one of the crown manhole covers sufficiently to pass the steam jet so as to run parallel with the side sheeting. The steam will circulate round the crown of the holder and make its exit at the point of entry. The following precautions should be taken when gasholder tanks are emptied for inspection and repairs to holders.

Take, for instance, a ground or brick tank. The bottom of the tank will often consist of puddled clay. Care should be taken to avoid the tank bottom becoming dry and the puddled clay cracking. To prevent this, the tank bottom or dumpling should be sprayed daily with a hosepipe. Another method to protect the puddled bottom is to cover same with wet sacking. By doing so you will obviate any possibility of leakage in the tank bottom when the gasholder tank is refilled.

I understand that recently the Home Office, in collaboration with the makers and representatives of the Industry, through The Institution of Gas Engineers, has evolved a set of rules for the preparation of water-sealed holders prior to repair. The rules are voluntary in adoption and, while I do not know that they have yet been circulated, I think any undertaking contemplating repairs to, or internal inspection of, a water-sealed holder would be well advised to apply for a copy of the rules for their guidance.

Steel Tanks.

When emptying a steel tank for the same purpose as mentioned above, it is advisable to protect all millboard joints in connection with inlet and outlet pipes, also the pads covering the lowering holes. These joints should be kept moist, otherwise they will perish and trouble may be experienced through leakage when the tank is refilled.

There have been many discussions of late regarding the internal conditions of gasholders and, in conclusion, I think it may interest you to know the results of an internal inspection carried out a few months ago on a two-lift gasholder in a steel tank erected in 1912.

Steel Tank.

The tank bottom plates and side plates up to and including the wind and water line were in perfect condition. Above the water line corrosive wasting had taken place to a depth of 50% of the plate.

Gasholder.

On the underside of the crown sheeting, general corrosive wasting had taken place to an alarming extent, also deep pitting was located in places. Corrosive grooving had taken place in close proximity to the underlying lap. The crown framing appeared to have suffered to the same extent.

Side Sheeting.

Results of a careful examination of the side sheeting were as follows:

North.—General corrosive wasting had taken place on the internal surface of the side sheeting and rivet heads. In some places the sheeting had corroded through.

East and West.—The surface of the sheeting was found to be in fair condition, though slight traces of corrosion could be observed.

South.—The side sheeting at this point was covered with a very fine film of tarry matter. On removing the film the sheeting was found to be in perfect condition. The inlet and outlet pipes were together and situated 3 ft. away from the side sheeting at the north side.

In conclusion I would say that, while in the scope of such a Paper as this I can do no more than touch on the fringe of one of the most interesting and necessary features of the routine work in a well managed undertaking, I trust that my remarks will have proved of some assistance. I shall be glad to answer, so far as is open to me, any questions you may care to ask.

The PRESIDENT expressed the thanks of the members to Mr. Booth for the trouble and time which he had devoted to the preparation of a Paper that was crammed full of information useful to everyone who possessed a gasholder. It was a Paper which they would take care to keep by them, for study whenever the need arose.

Gas Undertakings' Results

Darwen.

The annual report for the year ended March 31, 1935, on the Darwen Gas Department states that the revenue account shows a gross profit of £9,390, which, after payment of interest and sinking fund charges, leaves a net profit of £5,866, compared with £8,483 and £5,718 respectively last year. Expenditure on revenue account during the year was £29,271, compared with £30,704 last year, and the income was £38,661, against £39,186 in 1933-34. The credit balance on revenue account of £2,725 at the beginning of the year has been increased to £7,391. The gas made amounted to 187,937,000 cu.ft., a decrease of 1,808,000 cu.ft. Although the quantity of gas sent out from the Works decreased from 189,386,000 cu.ft. to 188,273,000 cu.ft., the gas sold was increased by 2,635,900 cu.ft. from 167,374,000 cu.ft. to 170,009,900 cu.ft., with consequent reduction in "unaccounted-for" gas by 3,748,900 cu.ft. from 11·62% to 9·7%. The net income from residuals was £4,668, equal to 9s. 10·18d. per ton of coal carbonized, compared with £5,113 and 9s. 11·23d. per ton of coal in 1934. The high quality of coke produced has been maintained with consequent necessity during the winter months to purchase coke from neighbouring gas undertakings in order to satisfy local demand. 271 yards of new mains have been laid during the year. The total length of mains in the area of supply is now 51 miles 1,271 yards. 38 new services have been laid during the year to new consumers, while 263 existing services have been renewed or repaired. The quantity of gas used in public street lighting was increased from 17,033,200 cu.ft. in 1934 to 17,273,200 cu.ft. in 1935, with consequent increased cost of £36. The number of lamps has increased from 1,010 to 1,018.

West Kilbride.

The annual meeting of West Kilbride Gas Light Company, Ltd., was held on July 29. The statement of accounts showed that the gross revenue for the year ended March 31 was £4,563, and the expenditure £3,785, leaving a profit of £778. A dividend of 7½%, less tax, was declared, absorbing £291.

[*Further Undertakings' Results will be found on p.* 474.]

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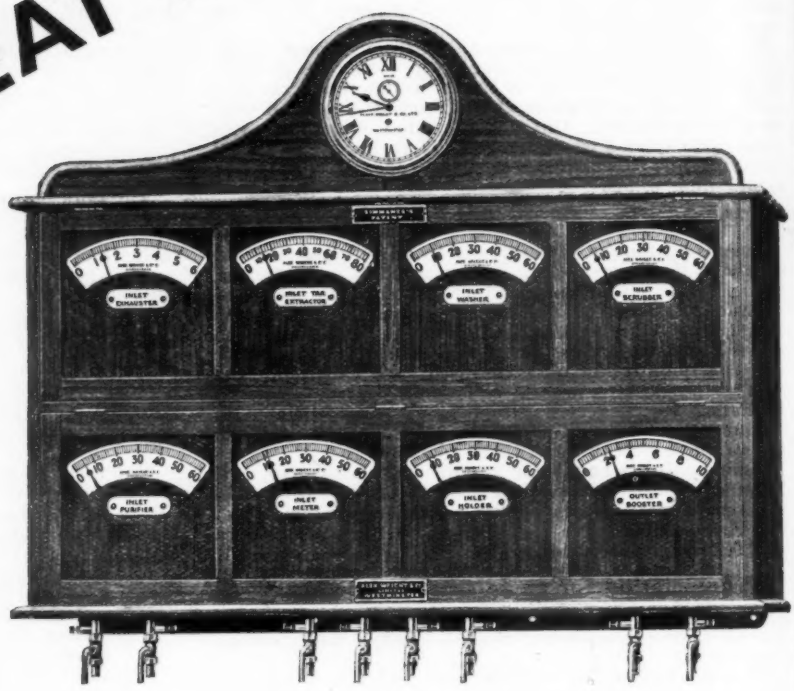
DEAD-BEAT INDICATORS



Accuracy and reliability being the first essentials in recording and indicating instruments Simmance Patent Dead-Beat Indicators and Recorders have these qualities in full measure—and retain them. That is why Dead-Beat instruments are used by most Gas Undertakings.

Batteries of Indicators only, Recorders only, or Indicators and Recorders can be supplied to customers' requirements.

ALEXANDER WRIGHT & Co. LTD. WESTMINSTER S.W. 1.

Gas Markets and Manufactures

Stock Market Report

(For Stock and Share List, see later page)

Throughout the greater part of last week International affairs were responsible for a general dullness in most of the Stock Markets, and the tendency was to close commitments and take profits combined with a hesitancy to make fresh purchases. Perhaps the least affected was the gilt-edged section, for the early weakness soon brought buyers into the market, and prices quickly responded. Towards the close, however, the nervousness of the previous few days almost disappeared and the tone became distinctly brighter, particularly in the home rail and industrial sections. In the absence of any further disturbing developments the current week should see a return to more active conditions.

As is usually the case, the Gas market remained unperturbed by any external complications and though the volume of business was not heavy prices continued firm with very few changes. It was noticeable that in several instances transactions were recorded at above top prices, but the quotations remained unchanged. Barnet ordinary recovered the *ex* div. reduction of a week ago and rose to its former value of 167½, a gain of 3 points; Gas Light 3% debenture was moved up 2 to 92½ and South Metropolitan 3% debenture 1 to 89½. On the other hand, a widening of the margins led to a slight reduction in Gas Light units to 28s., and in Imperial Continental ordinary to 215.

Current Sales of Gas Products

The London Market for Tar Products.

Aug. 26.

The Tar Products market remains quiet, with prices at about the following levels:

Pitch is 33s. to 34s. per ton f.o.b.

Creosote, about 6d. per gallon.

Refined tar, 4d. per gallon in bulk at makers' works.

Pure toluole, 2s. 2d. to 2s. 3d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha, 1s. 5d.; and 90/160 pyridine, about 4s. 6d. to 4s. 9d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Aug. 26.

The average prices of gas-works products during the week were: Gas-works tar, 18s. to 23s. Pitch—East Coast, 31s. to 33s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 31s. to 33s.* Toluole, naked, North, 1s. 8d. to 1s. 9d. Coal-tar crude naphtha, in bulk, North, 6¾d. to 7d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 5½d. Heavy naphtha, North, 9½d. to 10½d. Creosote, *ex* works, in bulk, North, liquid and salty, 5¼d. to 5½d.; low gravity, 5d. to 5¼d.: Scotland, 5d. to 5¼d. Heavy oils, in bulk, North, 5d. to 5½d. Carbolic acid, 60's, 1s. 11d. to 2s. Naphthalene, £10 to £11. Salts, 60s. to 75s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Aug.* 24.

Business in this district is confined to comparatively small quantities, and, while quotations are mainly unchanged, some slight alterations in actual values can be recorded.

Crude gas-works tar.—The actual value is 26s. to 28s. per ton *ex* works in bulk.

Pitch is without interest and to-day's value is not more than 30s. per ton f.o.b. Glasgow for export and about 30s. per ton *ex* works in bulk for home trade.

Refined tar is leaving the works in fair quantities at 2¾d. per gallon f.o.r. in buyers' packages.

Creosote oil continues in good call with prices steady. B.E.S.A. Specification, 5⅛d. to 5⅜d. per gallon; low gravity, 5¼d. to 5½d. per gallon; and neutral oil, 5¼d. to 5½d. per gallon; all f.o.r. in bulk.

Cresylic acid is featureless, although quotations are maintained. Pale, 97/99%, 1s. 1½d. to 1s. 2½d. per gallon; dark, 97/99%, 1s. to 1s. 0½d. per gallon; and pale, 99/100%, 1s. 2½d. to 1s. 3½d. per gallon; all *ex* works naked.

Crude naphtha is still commanding 4½d. to 5d. per gallon f.o.r., according to quality and district.

Solvent naphtha.—90/160 grade is 1s. 3½d. to 1s. 4d. per gallon, and 90/190 heavy naphtha is 10d. to 11d. per gallon.

Motor benzole is well sold forward with value called 1s. 3¼d. to 1s. 4d. per gallon in bulk at makers' works.

Pyridines.—90/160 grade is 5s. 6d. to 6s. per gallon, and 90/140 grade 6s. to 6s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s. d.		s. d.	
Crude benzole . . .	0 9½	to	0 10	per gallon at works
Motor ,, . . .	1 3	,,	1 3½	,, ,, ,,
90% ,, . . .	1 4	,,	1 4½	,, ,, ,,
Pure ,, . . .	1 7½	,,	1 8	,, ,, ,,

Contracts Advertised To-Day

Coal.
Selby Gas Department. [p. 478.]

Gasholders (Meter Testing).
London County Council. [p. 478.]

Lighting Standards.
Dewsbury County Borough. [p. 478.]

Pipes and Specials.
Clacton Gas and Water Department. [p. 478.]

Trade Notes

Thermometers, Hydrometers, &c.

Messrs. Short & Mason, Ltd., Walthamstow, E. 17, have purchased the business of Messrs. S. & A. Calderara, previously of Springfield Works, London, manufacturers of barometers, thermometers, hydrometers, and the like.

Further Gas Undertakings' Results

Shrewsbury.

The report of Directors of the Shrewsbury Gas Light Company for the year ended June 30, 1935, states that the Directors record with very great regret the death of Mr. Alfred Mansell, who had been a Director since 1923. Mr. J. B. Gouldbourn has been elected to fill the vacancy on the Board. The gross profit on the revenue account amounts to £10,130. After allowing for the interim dividend of 2½% (less tax) paid in March last, and the interest on mortgages for the year, the balance of net profit available amounts to £12,774. The Directors recommend that a final dividend of 4½% (less tax), making 6¾% (less tax) for the year, be declared, payable on and after Sept. 3, 1935. The reserve fund stands at £13,857. The new gasholder has been completed and put into commission during the year. There has been a decrease of 5 million cu.ft. in the volume of gas sold during the past year, largely due to the extremely mild winter. The number of cookers on hire at June 30 was 5,259, together with 2,123 fires and radiators. There were also 3,307 ordinary meters, and 7,184 prepayment meters in use. In addition, the number of gas cookers, fires, water heaters, &c., sold during the year amounted to 1,477.

Wellingborough.

The report of the Directors and accounts of the Wellingborough Gas Light Company, Ltd., for the year ended June 30, 1935, show that the suspense account of £2,500 brought forward from last year has been cleared by a charge in the revenue account. An interim dividend of £4,687 was paid on March 1. After providing for interest there remains an available balance of £9,069. The Directors recommend that dividends at the same rate as before (7½% on the "Original" and 6% on the "Additional" shares, less income-tax) be declared for the half-year, and paid on Sept. 2. The payment of dividends and tax thereon will absorb the sum of £4,687, leaving a balance of £4,382 to be carried forward. At an Extraordinary Meeting following the Ordinary General Meeting shareholders will be asked to approve of the Company's proposed application for a Special Order providing for the amalgamation of the Undertaking of the Irthlingborough Gas Light and Coke Company, Ltd., with the Company. The proposal is in accordance with the policy strongly recommended by the national advisory bodies, of linking small companies with larger neighbours, and the Directors are satisfied that, if carried out, it will benefit both Companies.

For increased efficiency in every process related to gas manufacture . . . .

THE WEST SYSTEMS

OF CARBONIZATION, FUEL-HANDLING AND TREATMENT

The West organization has co-operated with leading gas undertakings of 22 countries in schemes of modernization, plant renewal and extension. Most of the world's principal gas coals have been treated in our Research Gas Works

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BREEZE-BURNING PRODUCERS AND WASTE-HEAT RECOVERY PLANT
MODERN METHODS OF COAL & COKE HANDLING & TREATMENT

WEST'S GAS IMPROVEMENT COMPANY, LTD.

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STOCK AND SHARE LIST

Official Quotations on the London and Provincial Stock Exchanges

Issue. £	Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations, Aug. 23.	Rise or Fall on Week.	Transactions, Lowest and Highest Prices During the Week.
1,551,868	Stk.	Mar. 11	7	7	Alliance & Dublin Ord. ...	132—142	...	...
374,000	"	June 24	4	4	Do. 4 p.c. Deb. ...	90—100	...	...
557,655	"	Aug. 12	7	7	Barnet Ord. 7 p.c.	165—170*	+3	166½—168½
300,000	1	Apl. 8	1/4½	1/9½	Bombay, Ltd.	1 7/16—1 11/16	...	...
178,480	Stk.	Aug. 12	9½	9½	Bournemouth sliding scale ...	222—232*	...	...
350,050	"	"	7	7	Do. 7 p.c. max. ...	168—173*	...	169—171
489,160	"	"	6	6	Do. 6 p.c. Pref. ...	147—152*	...	...
50,000	"	June 24	3	3	Do. 3 p.c. Deb. ...	85—90	...	...
262,025	"	"	4	4	Do. 4 p.c. Deb. ...	106—111	...	...
335,000	"	"	5	5	Do. 5 p.c. Deb. ...	123—128	...	...
357,900	"	Aug. 12	7½	7½	Brighton, &c., 6 p.c. Con. ...	170—175*	...	...
649,955	"	"	6½	6½	Do. 5 p.c. Con. ...	150—155*	...	155—156
205,500	"	"	6	6	Do. 6 p.c. B. Pref.	142—147*	...	...
1,487,500	"	July 8	5	5	Bristol, 5 p.c. max.	120—122*a*	—½	...
120,420	"	June 7	4	4	Do. 1st 4 p.c. Deb. ...	102—104*a*	...	...
217,870	"	"	4	4	Do. 2nd 4 p.c. Deb. ...	101—103*a*	...	...
328,790	"	"	5	5	Do. 5 p.c. Deb.	127—130*a*	...	...
855,000	"	Mar. 11	7	8	British Ord.	154—159	...	156½—158½
100,000	"	June 7	7	7	Do. 7 p.c. Pref. ...	160—165	...	...
350,000	"	"	5½	5½	Do. 5½ p.c. "B" Cum. Pref.	112—117	...	...
120,000	"	"	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...	...
450,000	"	"	5	5	Do. 5 p.c. Red. Deb. ...	109—114	...	...
200,000	"	"	...	17/6	Do. 3½ p.c. Red. Deb. ...	99—101	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	...
100,000	10	6 Nov.'33	4½	4½	Do. 4½ p.c. Pref. ...	1—3	...	...
150,000	Stk.	June 24	4½	4½	Do. 4½ p.c. Deb. ...	83—88	...	...
626,860	"	July 22	6	6	Cardiff Con. Ord.	127—132*	...	...
237,860	"	June 7	5	5	Do. 5 p.c. Red. Deb.	107—112	...	...
157,150	"	Aug. 12	6½	5	Chester 5 p.c. Ord.	109—114*b*	...	...
98,936	1	Mar. 25	2/-	2/-	Colombo, Ltd., Ord.	1 5/16—1 7/16	...	...
24,500	1	"	1/4½	1/4½	Do. 7 p.c. Pref. ...	20/6—22/6	...	...
609,204	1	Mar. 25	-/11·48	-/11·48	Colonial Gas Assn. Ltd. Ord.	20/6—22/6	...	...
296,053	1	"	1/3·30	1/3·30	Do. 8 p.c. Pref.	26/—28/-	...	...
1,775,005	Stk	Aug. 12	6	5	Commercial Ord.	101—106*	—1	101½—104
620,000	"	June 7	3	3	Do. 3 p.c. Deb. ...	85—90	...	90—92
286,344	"	Aug. 12	5	5	Do. 5 p.c. Deb. ...	121—126*	...	...
807,560	"	Aug. 12	7	7	Croydon sliding scale... ...	152—157*	...	153—156
569,590	"	"	5	5	Do. max. div.	113—118*	...	114½—116½
620,385	"	June 24	5	5	Do. 5 p.c. Deb.	123—128	...	127½
542,270	"	Aug. 12	10	7	Derby Con.	180—190*c*	...	...
55,000	"	June 24	4	4	Do. 4 p.c. Deb.	100—105*c*	...	...
239,000	"	Aug. 12	5	5	East Hull Ord. 5 p.c.	106—111*	...	110
181,625	"	Aug. 12	6	6	East Surrey Ord 5 p.c. ...	129—134*	...	...
175,609	"	June 7	5	5	Do. 5 p.c. Deb. ...	123—128	...	...
1,002,180	"	Mar. 11	†	†7	European, Ltd.	170—180	...	...
19,313,481	"	Aug. 12	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	27/6—28 6*f**	—/3	27/7½—28/4½
2,600,000	"	"	3½	3½	Do. 3½ p.c. max.	88—91*	...	89½—91
4,477,106	"	"	4	4	Do. 4 p.c. Con. Pref. ...	108—111*	+1	108—110
8,602,497	"	June 7	3	3	Do. 3 p.c. Con. Deb. ...	91—94	+2	91½—93½
3,642,770	"	"	5	5	Do. 5 p.c. Red. Deb. ...	115—118	...	...
3,500,000	"	"	4½	4½	Do. 4½ p.c. Red. Deb. ...	113—116	...	115
270,466	"	Aug. 12	6	6	Harrogate New Cons. ...	132—137*	...	...
140,000	1	Mar. 25	1/7½	1/7½	Hongkong & China, Ltd. ...	1½—1½	...	...
213,200	Stk.	Aug. 12	6	6	Hornsey Con. 3½ p.c.... ...	130—135*	...	...
5,600,000	"	May 13	10	14	Imperial Continental Cap. ...	210—220	—2½	201½—217½
223,130	"	July 22	3½	3½	Do. 3½ p.c. Red. Debs.	91—96	...	...
285,242	"	Aug. 12	8½	8½	Lea Bridge 5 p.c. Ord. ...	175—180*	...	...
2,167,410	"	Aug. 12	6	6	Liverpool 5 p.c. Ord.... ...	138—140*b**	...	...
245,500	"	June 7	5	5	Do. 5 p.c. Red. Pref. ...	105—110*b*	...	...
306,083	"	July 8	4	4	Do. 4 p.c. Deb.	103—106*b*	...	...
165,736	"	Feb. 18	8	10	Maidstone 5 p.c. Cap. ...	185—195	...	...
63,480	"	June 24	3	3	Do. 3 p.c. Deb. ...	82—87	...	85½
75,000	"	May 27	†10	†10	Malta & Mediterranean ...	212—222	...	217—218
392,000	—	Apl. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	100—105	...	...
231,978	Stk.	Aug. 12	5	5	M. S. Utility "C" Cons. ...	108—113*	...	...
818,657	"	"	4	4	Do. 4 p.c. Cons. Pref.	101—106*	...	103—104
360,075	"	June 24	4	4	Do. 4 p.c. Deb. ...	103—108	...	...
148,955	"	"	5	†5	Do. 5 p.c. Deb. ...	123—128	...	...
125,000	—	July 1	3½	3½	Do. 3½ p.c. Rd. Rg. Bds.	97—100	...	...
675,000	"	June 24	†13	†13	Montevideo, Ltd.	48—58	...	51
2,061,315	"	Aug. 12	5½	5	Newcastle & Gateshead Con.	25/—26/-*df**	—/3	...
682,856	"	"	4	4	Do. 4 p.c. Pref. ...	106½—107½*d**	...	...
776,706	"	June 7	3½	3½	Do. 3½ p.c. Deb. ...	99—101*d*	...	...
277,285	"	Oct. 8	5	5	Do. 5 p.c. Deb. '43 ...	105—107*d*	...	...
274,000	"	Aug. 12	5	5	Newport (Mon.) 5 p.c. max....	113—118*a**	...	...
225,000	"	Aug. 12	7½	7½	North Middlesex 6 p.c. Con.	162—172*	...	172½
396,160	"	Aug. 12	5	5	Northampton 5 p.c. max. ...	105—110*	...	...
300,000	"	Apl. 29	†9	†7	Oriental, Ltd.	168—173	...	...
416,617	"	June 7	8	8	Plym'th & Stonehouse 5 p.c.	162—167	...	...
504,416	"	Aug 12	8½	8½	Portsm'th Con. Stk. 4 p.c. Std.	170—175*	...	...
241,446	"	"	5	5	Do. 5 p.c. max. ...	108—113*	...	...
114,000	"	July 22	5	5	Preston 5 p.c. Pref.	106—111*	...	...
321,961	1	Apl. 8	...	...	Severn Val. Gas Cor. Ld. Ord.	22/—23/-	...	...
319,510	1	Mar. 25	...	...	" " 4½ p.c. Cum. Pref.	22/—23/-	...	...
1,736,968	Stk.	Feb. 18	6	6	Sheffield Cons.	142—144*e*	+1	...
95,000	"	June 24	4	4	Do. 4 p.c. Deb.	102—104*e*	...	...
133,201	"	Aug. 12	5	8½	Shrewsbury 5 p.c. Ord. ...	139—144*	...	...
90,000	10	May 27	‡3	‡3½	South African	3—4	...	...
1,061,779	1	May 13	1/2½	1/2½	South East'n Gas Cn. Ld. Ord.	28/—29/-	...	28/7½—28/9
845,016	1	Mar. 11	-/10½	-/10½	Do. 4½ p.c. Red. Cum. Pref.	22/6—23/6	...	...
450,000	Stk.	Aug. 12	4	4	Do. 4 p.c. Red. Deb. ...	100—103*	...	...
6,709,895	"	Aug. 12	6½	5	South Met. Ord.	131—136*	...	131—135
1,135,812	"	"	6	6	Do. 6 p.c. Irred. Pf. ...	147—152*	...	149—150½
850,000	"	"	4	4	Do. 4 p.c. Irred. Pf. ...	107—110*	...	...
1,895,445	"	June 24	3	3	Do. 3 p.c. Deb. ...	88—91	+1	90½
1,000,000	"	July 8	5	5	Do. 5 p.c. Red. Deb....	112—117	...	115
209,820	"	Aug. 12	8½	8½	South Shields Con.	171—173*d**	...	...
1,543,795	"	Aug. 12	6	6	South Suburban Ord 5 p.c. ...	128—133*	...	...
512,825	"	"	5	5	Do. 5 p.c. Pref. ...	121—126*	...	...
500,000	"	"	4	4	Do. 4 p.c. Pref. ...	105—110*	...	108
888,587	"	June 7	5	5	Do. 5 p.c. Deb. ...	123—128	...	127½
250,000	"	"	4	4	Do. 4 p.c. Deb. ...	105—110	...	...
647,740	"	Aug. 12	5	5	Southampt'n Ord. 5 p.c. max.	115—120*	...	116—117
121,275	"	June 7	4	4	Do. 4 p.c. Deb.	100—105	...	...
350,000	"	Aug. 12	5½	5½	Swansea 5½ p.c. Red. Pref. ...	113—118*	...	116
200,000	"	June 7	6½	6½	Do. 6 p.c. Red. Deb. ...	98—103	...	...
1,076,490	"	Aug. 12	6½	6½	Tottenham and District Ord.	145—150*	...	...
409,835	"	"	5½	5½	Do. 5½ p.c. Pref. ...	130—135*	...	...
62,235	"	"	5	5	Do. 5 p.c. Pref. ...	120—125*	...	...
334,615	"	June 7	4	4	Do. 4 p.c. Deb. ...	101—106	...	...
369,774	"	Aug. 12	7	7	Uxbridge, &c., 5 p.c.	148—153*	...	153—154½
108,330	"	"	5	5	Do. 5 p.c. Pref. ...	118—123*	...	...
1,326,700	"	Aug. 12	7	7	Wandsworth Consolidated ...	155—160*	...	...
1,371,373	"	"	5	5	Do. 5 p.c. Pref. ...	121—126*	...	124½—125½
1,317,964	"	June 7	5	5	Do. 5 p.c. Deb. ...	125—130	...	...
338,300	"	"	4	4	Do. 4 p.c. Deb. ...	102—107	...	...
158,400	"	Aug. 12	6*g*	5	Winchester W.& G. 5 p.c. Con.	114—119*	...	...

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